



MegaPower[®] CPU

ADMPCPU

Installation and Service Guide

MegaPower® CPU

Installation and Service Guide



ADMPCPU

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Overview

The MegaPower CPU (MPCPU) is the control unit for the MegaPower 3200 CCTV matrix switcher. The control unit:

- Enables setup and control of cameras, monitors, users, alarms, video recording and data communications
- Provides two AD data lines and 16 RS-232 COM ports
- When two MPCPUs are connected together, they double the AD data lines and RS-232 ports, and provide “hot switch” CPU operation
- Runs on a 12Vdc external power supply.

The MPCPU consists of:

- MPU (Multiple Purpose Unit) module. Contains the CPU and stores camera configuration data.
- Port module. Provides connections for camera control data and CCTV input devices such as keyboards.

Safety Guidelines



WARNING!

Installation and service is to be performed by qualified personnel.

Wire in accordance with national wiring regulations of the country of installation.

The unit is designed for use in general purpose CCTV installations and has no other function.

DO NOT exceed voltage and temperature limits listed in these instructions.

Use this unit in a clean, dust-free environment.

The unit must be powered by the provided Limited Power Source, certified for the country of use.

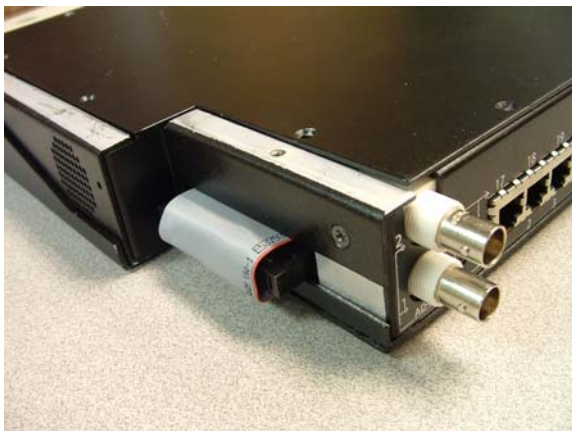
Installation

The MPCPU unit is installed in a 48.3cm (19in) equipment rack. Use screws supplied with the rack or purchase screws separately.

Single MPCPU (A)

Refer to diagrams on pages 3 and 4 while performing the following procedure. This MPCPU is designated "A".

1. Ensure the ribbon cable at the side of the MPU module is connected to the module itself (and not hanging).

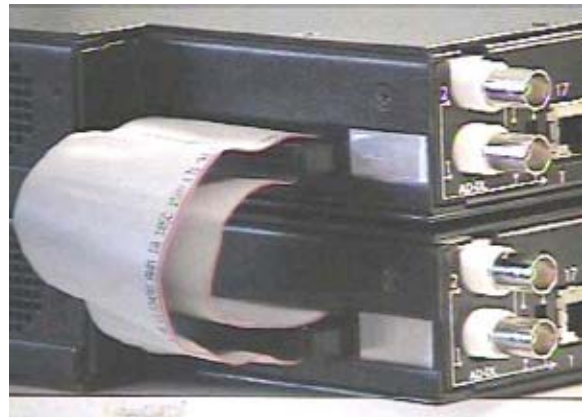


2. Insert MPCPU A in the equipment rack and secure using suitable hardware.
3. Connect the power supply to the unit and plug the supply into a standard ac outlet.
4. Attach the power supply module to the rack using Velcro material supplied.
5. Connect the MPCPU to the necessary equipment. See Appendices in this guide for connection diagrams.
6. Move the AD Data Line switch on the rear of the MPU to the down position to select data lines 1 and 2, and COM ports 1–16.
7. Connect camera control data cables from the bay switches and keyboards (for basic matrix switching bay connections, see Appendix C; for keyboard, Intellex, and computer connections, see Appendices D–H).

Second MPCPU (B)

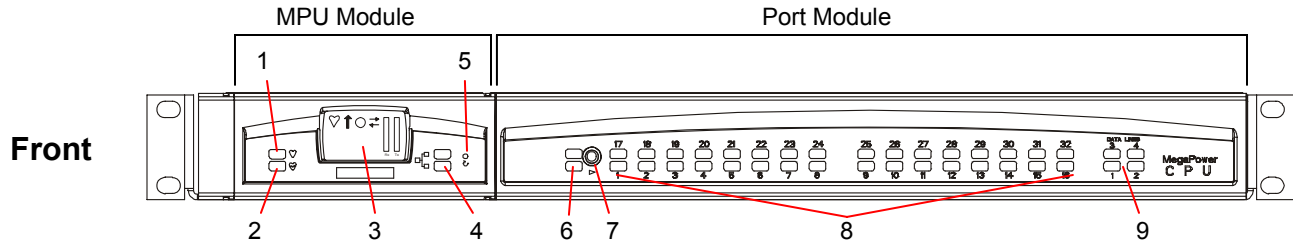
The second MPCPU, designated "B", is used to double the AD data lines and RS-232 COM ports, and as a backup in a hot switch setup (See Appendix A).

1. Insert MPCPU B in the equipment rack either just above or just below MPCPU A and secure using suitable hardware.
2. Connect the ribbon cables between the two units top to bottom, bottom to top.














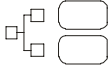




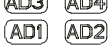
3. Connect the power supply to the unit and plug the supply into a standard ac outlet.
 4. Attach the power supply module to the rack using Velcro material supplied.
 5. Press the recessed Select button on the front panel to select the CPU to drive the hot switch setup.
 6. Move the AD Data Line switch on the rear of the MPU to the up position to select data lines 3 and 4, and COM ports 17–32.
- IMPORTANT!** Make sure that AD Data Lines and COM ports for MPCPUs A and B are not set the same. Also make sure that software settings for the COM ports are the same for both MPCPUs.
7. Connect camera control data cables from the bay switches and keyboards (for basic matrix switching bay connections, see Appendix C; for keyboard, Intellex, and computer connections, see Appendices D–H).

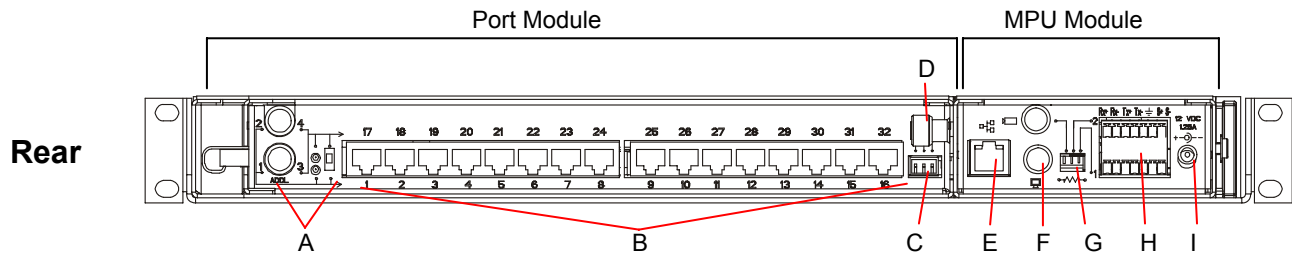
Indicators, Settings, and Connections



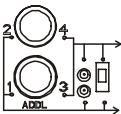

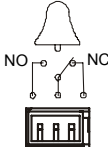
Front Panel (left to right)



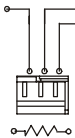

1	Heart Beat 	Upon power up or reset, blinks once for ROM and RAM test completion (stays lit and operation halts if either test fails). Otherwise, blinks steadily to show processor is operating.
2	Broken Heart 	Blinks once upon power up or reset. Then only blinks when a fault occurs (along with a beep). An error code displayed by the Message Center indicates the fault.
3	Message Center	<p>Displays MPCPU error codes and the following symbols:</p> <p>FULL BEATING HEART = MPU is communicating</p> <ul style="list-style-type: none"> BROKEN HEART = MPU not communicating NONE = no MPU in a hot switch setup is communicating. <p> or  or NONE</p> <ul style="list-style-type: none"> UP arrow = the selected unit in a hot switch set up. DOWN arrow = the backup unit, if used. <p> or </p> <ul style="list-style-type: none"> CLEAR circle = normal operation. DARK circle = a fault in the MPCPU. <p> or </p> <ul style="list-style-type: none"> CIRCULAR arrow = MPCPU with ribbon cable connected to itself. OPPOSING arrows = two MPCPUs hot switched together. NONE = CPUs are not communicating. <p> or  or NONE</p> <ul style="list-style-type: none"> Rx/Tx levels (show data activity). Bars = maximum levels reached. <p></p>

4	Network Indicators 	Indicates activity on the network. <ul style="list-style-type: none"> GREEN solid (Ethernet connectivity) or flashing (Ethernet activity) AMBER ON (Ethernet 100Base-T) or OFF (Ethernet 10Base-T)
5	Power Reset Switch 	Recessed button is used to reset the MPCPU. Use a paper clip to press.
6	RS-232 COM Port Module Select 	LEDs blink to show the COM ports selected by a slide switch on the rear panel: 1–16 or 17–32. Note: If two units are hot switched together, do not set both to the <u>same</u> COM ports.
7		Recessed button is used to select the CPU that drives a dual unit hot switch setup. The message center displays the up arrow to indicate the selected CPU.
8	RS-232 COM Port Activity 	LEDs show activity of COM ports 1–16 or COM ports 17–32.
9	Data Line Activity 	Indicates data sent on the AD data lines selected by a slide switch on the rear panel: AD1–2 or AD3–4.



Rear Panel (left to right)

A	<p>AD Data Lines / COM Ports</p> <p>1–2 or 3–4</p> 	<p>Control data is sent via these two BNC connectors to switching bays, code generation devices, and accessories that are part of the matrix switching system. Use high-speed coax RG59 or equivalent. Plug a 75-ohm terminator BNC into the last device.</p> <p>Adjacent to these lines is a slide switch.</p> <ul style="list-style-type: none">UP position selects AD data lines 3–4 and COM ports 17–32 (indicated by the top LED).DOWN position selects AD data lines 1–2 and COM ports 1–16 (indicated by the bottom LED).UP/DOWN LEDs on the front panel indicate the switch position. <p>The number of monitors, camera, and camera PTZ functions controlled is as follows:</p> <table><thead><tr><th>DATA LINE</th><th>MON</th><th>CAM</th><th>PTZ</th></tr></thead><tbody><tr><td>1</td><td>1–64</td><td>1–3200</td><td>1–1024</td></tr><tr><td>2</td><td>65–128</td><td>1–3200</td><td>1025–2048</td></tr><tr><td>3</td><td>129–192</td><td>1–3200</td><td>2049–3072</td></tr><tr><td>4</td><td>193–256</td><td>1–3200</td><td>3073–3200</td></tr></tbody></table>	DATA LINE	MON	CAM	PTZ	1	1–64	1–3200	1–1024	2	65–128	1–3200	1025–2048	3	129–192	1–3200	2049–3072	4	193–256	1–3200	3073–3200
DATA LINE	MON	CAM	PTZ																			
1	1–64	1–3200	1–1024																			
2	65–128	1–3200	1025–2048																			
3	129–192	1–3200	2049–3072																			
4	193–256	1–3200	3073–3200																			
B	<p>RS-232 COM Ports</p> <p>1–16 or 17–32</p> 	<p>RJ-45 connectors are used to connect keyboards, alarm interfaces, video loss modules, port expanders, access control, and third party accessories.</p>																				
C	<p>Alarms</p> 	<p>Annunciators can connect to normally open (NO) or normally closed (NC) contacts depending on requirements. The relay changes from the NC state if one of the dual MPCPU's is not operating.</p> <p>The relay will also change if two hot-switched MPCPU's are set to the <u>same</u> com port setting (UP or DOWN).</p>																				

D	Thumbnut	Turn counterclockwise to release the MPU module from the port module.
E	Ethernet Connection 	<p>LEDs in the connector indicate activity on the network.</p> <ul style="list-style-type: none"> GREEN solid (Ethernet connectivity) or flashing (Ethernet activity) AMBER ON (Ethernet 100Base-T) or OFF (Ethernet 10Base-T)
F	Video In/Out BNC 	<p>VIDEO IN BNC (top) can be used for manual snapshots. Connect this BNC to a matrix switch VOM output dedicated for snapshots.</p> <p>Note: Manual snapshots reduce VOM outputs used by monitors by one. Be sure to terminate the video line (see Line Termination Switches below). See example in Appendix C.</p> <p>VIDEO OUT BNC (bottom) is not used.</p>
G	Line Termination Switches 	<p>Use to terminate the Video In line, and the two SensorNet or Manchester connections. Press appropriate switch down to terminate.</p>
H	RS-422 / SensorNet Data Connector 	<p>Default configuration is SensorNet and can accept up to two SensorNet data lines (for up to 508 cameras).</p> <ul style="list-style-type: none"> Ch.1 is for 1-254 cameras (camera numbers 1-254) Ch.2 is for 1-254 cameras (camera numbers 255-508) <p>EASY CPU software can configure ports to provide:</p> <ul style="list-style-type: none"> Two connections that can be independently set for SensorNet or Manchester data transmission. Two additional connections for AD RS-422/485 that can be independently configured as RS-232 signals for AD RS-422/485 distribution panels. <p>See Data Connector Pin Assignments (next page).</p>
I	Power Input	12Vdc (+ in center).

Protocol	Data Connector Pin Assignments
SensorNet	Pin 5 Not used Pin 6 S+ (orange wire) Pin 7 S- (yellow wire, right most pin)
Manchester	Pin 5 Shield ground Pin 6 S+ (black wire) Pin 7 S- (white wire, right most pin)
AD RS-422 / RS-485	Pin 1 RX+ (yellow wire, left most pin) Pin 2 RX- (brown wire) Pin 3 TX+ (orange wire) Pin 4 TX- (green wire) Pin 5 Shield ground
AD RS-422 / RS-485 when configured to RS-232 signals	Pin 2 RXD Pin 4 TXD Pin 5 Ground

Parts Supplied

ADMPCPU Firmware (0201-0016-01)

MegaPower CPU Install Kit 0352-0228-01

<u>Part</u>	<u>Qty</u>	<u>Part Number</u>
Velcro Dual Lock	1	3200-0357-02
Connector, 3-Pin	1	2109-0510-03
Connector, 7-Pin	2	2109-0726-07
Connector, Plug	3	2109-0848-01
Power Supply	1	2025-0398-01
Power Cable, UK	1	6003-0221-01
Power Cable, US	1	6003-0239-01
Power Cable, Euro	1	6003-0240-01
Terminator, BNC	1	2113-0014-01

Troubleshooting

INDICATION	ACTION
Message center or LEDs not on	Check AC connection. Check 12Vdc power supply.
Broken or no heart	No CPU communication.
Dark circle in message center	CPU failure. Press system reset next to message center. Disconnect the MPU from the port module and reset the module again.
No keyboard communication	Check baud rate. Check keyboard wiring. Verify MPU and port modules are connected (try other ports). Press power reset next to LCD.
AD data line LEDs not pulsing	Cycle power. Press power reset next to LCD. Reconnect MPU and port modules.
Cannot communicate with EASY CPU software	Check line connections. Check network settings on the PC and MPCPU. From the PC command prompt, perform a ping test of the MPCPU IP address.
No dome/PTZ direct connection control	From a keyboard, perform a ping test of the dome. Check settings in the EASY CPU "Direct Dome/PTZ Connections" screen. Check cable connections.

Specifications

MegaPower 3200 Operational

Bandwidth	17MHz
Frequency response	±0.5dB to 12MHz
Signal-to-noise ratio	65dB (<i>V_{p-p}</i> vs. <i>V_{rms}</i> noise)
Crosstalk:	
Adjacent channels	-55dB (at 3.58MHz)
Input-to-input	-70dB (at 3.58MHz)
Differential delay	±1.0°
Differential phase	1.5° or better
Differential gain	1.0% or better
Tilt	0.5% or better
Gain	Unity (±1dB)
Return loss (input/output)	≥40dB
DC level (video signal)	0V
Switching	Complete switching of cross-point matrix, EIA RS-170 and NTSC, CCIR and PAL
Switching speed	Less than 20ms (typical)
Keyboard/Receiver control time	20ms (typical)
Phase adjustment	180° vertical interval adjustment for switching bay
Non-volatile memory	Setup information saved in permanent flash memory
On-screen text	Date/time, video input number, video input title, site number, site title monitor status, user/keyboard number
Character set	Alpha numeric

MPCPU Electrical

AC-DC Power Supply	
Operational rating	100–240Vac, 50-60Hz, 0.4A, 42VA
Operational limit	90-265Vac, 47–63Hz
Power consumption	0.5A max at 90Vac input
Protection	Internal primary current fuse Inrush limiting
Power to MPU	12Vdc, 1.25A, 15W Certified Limited Power Source, NEC Class 2

MPCPU Connections

Power input	IEC 320
Video inputs	0.5 to 2.0V _{p-p} , composite BNC
RS-232 ports	RJ-45 modular 8-pin jacks
AD data line out	2 BNC connectors
Dome/PTZ direct connection	2 Euro-style 7-pin removable plug 3.81mm terminal blocks

SensorNet Dome Control Direct Connection

Address range	1 to 254
Bit rate	230.4 Kbps
Network distance	1km (3300ft) per cable segment with repeaters; 1.5km (5000ft) per cable segment without repeaters
Maximum loads	32 per UTP cable segment
Cable segment repeaters	ADACSNETD(P) distribution panel, SensorNet junction box, and fiber optics module
Topologies	Daisy Chain, Backbone, or Star
Transmission medium	Single, non-polarized, unshielded twisted pair UTP 22AWG (0.326mm ²)
Terminating resistor	120Ω, switch selectable
Physical layer	RS-485, transformer isolated, 2-wire
Data encoding	BiPhase-Space; FM-0
Link layer framing	SDLC/HDLC
Link layer channel	Bi-directional, half duplex
Collision avoidance	Host primary polling by selected MPCPU
Application protocol	Proprietary
Secondary devices	Dome, ADACSNETD(P) distribution panels, SensorNet junction boxes
Dome firmware update	ADACSNET USB module

Manchester Dome / PTZ Device Direct Connection

Address range	1 to 64
Bit rate	31 Kbps
Network distance	1.5km (5000ft)
Maximum loads	3 per STP cable segment
Cable segment repeaters	ADACSNETD(P) distribution panel, AD1691(F-1) distributor, and fiber optics module
Topology	Daisy Chain
Transmission medium	Single twisted pair Belden 8760 18AWG (0.823mm ²) polarized, shielded
Terminating resistor	120 ohms, switch selectable
Physical layer	RS-485, transformer isolated, 2-wire
Data encoding	Manchester
Link layer framing	Proprietary
Link layer channel	Simplex
Application protocol	Proprietary
Secondary devices	Dome, PTZ device, ADSNETD(P) distribution panel, And AD1691(F-1) distributor

AD RS-422 / RS-485 Protocol for Dome / PTZ Device Direct Connection

Address range	1 to 100
Bit rate	4.8 Kbps
Network distance	1km (3300ft) per cable segment
Maximum loads	10 per cable segment
Cable segment repeaters	ADAC422D(P) distribution panel, and RS-422 junction box
Topology	Daisy Chain, Star
Transmission medium	Two twisted pairs 22AWG (0.326mm ²) polarized, shielded
Physical layer	RS-485, 4-wire, or RS-232
Data encoding	Start bit and one stop bit
Link layer framing	Asynchronous, 8 data and 0 parity bits
Link layer channel	Full duplex
Collision avoidance	Host primary polling by selected MPCPU
Application protocol	Proprietary
Secondary devices	Dome, ADAC422D(P) distribution panel, And RS-422 junction box

MPCPU Surge Protection

Ethernet Port 10/100 Base-T transformer

SensorNet/Manchester Ports

Gas discharge tube impulse rated at:	
DC breakdown voltage	90V
Insulation resistance	10,000MΩ
Capacitance	2pf Max
8/20μs impulse discharge current	10kA
Ten 8/20μs impulses discharge current	5kA
Isolation transformer coupled	2000Vrms
PTC re-settable fuse protects transformer	
Transient Voltage Suppressors (TVS):	
Breakdown voltage	7.6–9.3V
Peak current	40A
Capacitance	2000pF @ 1kHz

AD RS-422/RS-485 Dome/PTZ Device Direct Connection

Transient Voltage Suppressors (TVS):	
Breakdown voltage	7.6–9.3v
Peak current	40A
Capacitance	2000pF @ 1kHz
Gas discharge tube impulse rated at:	
DC breakdown voltage	90v
Insulation resistance	10,000MΩ
Capacitance	2pF max.
8/20μs impulse discharge current	10kA
Ten 8/20μs impulses discharge current	5kA

RS-232 Com Ports

Transient Voltage Suppressors (TVS):	
Breakdown voltage	7.6–9.3V
Peak current	40A
Capacitance	2000pF @ 1kHz
Gas discharge tube impulse rated at:	
DC breakdown voltage	90V
Insulation resistance	10,000MΩ
Capacitance	2pF max.
8/20μs impulse discharge current	10kA
Ten 8/20μs impulses discharge current	5kA

AD Data Line Ports

Gas discharge tube impulse rated at:	
DC breakdown voltage	90V
Insulation resistance	10,000MΩ
Capacitance	2pF max.
8/20μs impulse discharge current	10kA
Ten 8/20μs impulses discharge current	5kA

DC Power Input

Surge protection	PTC resettable fuse protects regulator Transguard rated at 60V, 250A, 1.5 Joules Gas discharge tube impulse rated at 10kA
Allowable drop out:	150ms

MPCPU Mechanical

Mounting	Designed for EIA-310-D and IEC 60297-1 standard 482.6mm (19in) electronic racks
Dimensions (H x W x D)	44.5 x 481.6 x 304.8mm (1.75 x 19 x 12in.)
Weight	3.2kg (10 lbs)

MPCPU Environmental

Operating temperature	0° to 40°C (32° to 104°F)
Humidity	0 to 95% relative humidity (non-condensing)

Declarations

Regulatory Type:

ADMPCPU-MPU
ADMPCPU-PORT
ADMPCPU-TRAY

Regulatory Compliance

EMC.....	47 CFR, Part 15 EN 50130-4 EN 55022 EN 61000-3-2 EN 61000-3-3
Safety	UL/IEC/EN/CSA C22.2.60950-1
Environmental.....	RoHS 2002/95/EC WEEE 2002/96/EC IP code X0

FCC COMPLIANCE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

EQUIPMENT MODIFICATION CAUTION: Equipment changes or modifications not expressly approved by Sensormatic Electronics Corporation, the party responsible for FCC compliance, could void the user's authority to operate the equipment and could create a hazardous condition.

Other Declarations

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MDR 10/2008

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Appendix A: Hot Switch Setup

The following applies when two MPCPUs connect together for redundancy.

Selected Unit. Since both MPU modules are actively processing incoming data, the term “selected” identifies which unit is driving the lines.

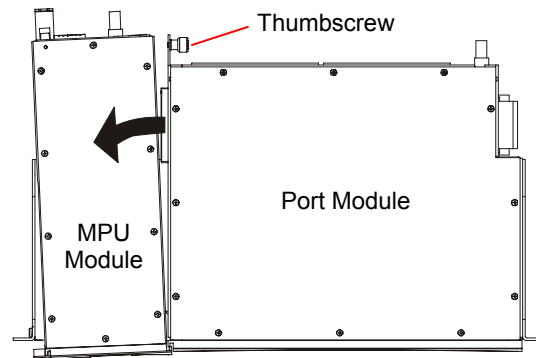
Backup Unit. An MPU module whose CPU is not driving AD data lines and RS-232 COM ports. However, it is still actively processing incoming data so it can hot switch over if the selected unit fails.

UP arrow in message center. Indicates an MPCPU with AD data lines 1–2 and RS-232 COM ports 1–16 selected.

DOWN arrow in message center. Indicates an MPCPU with AD data lines 3–4 and RS-232 COM ports 17–32 selected.

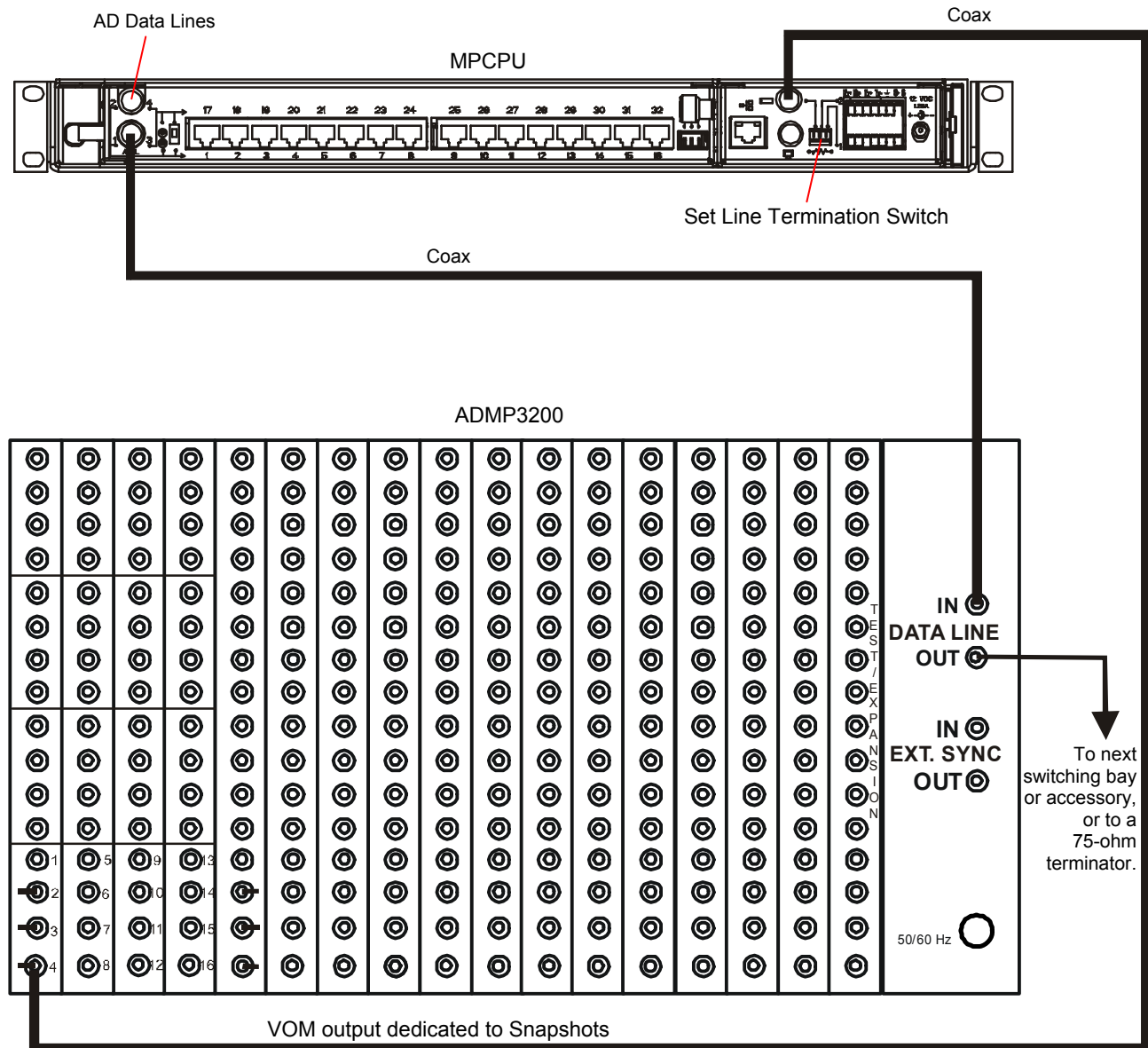
Appendix B: Detaching the MPU from the Port Module

1. Loosen the thumbscrew in the back of the assembly.
2. Push the MPU module away from the Port module, detaching it from the blind connector.
3. Remove the MPU module.



Appendix C: Basic ADMP3200 Matrix Switcher to MPCPU Connection

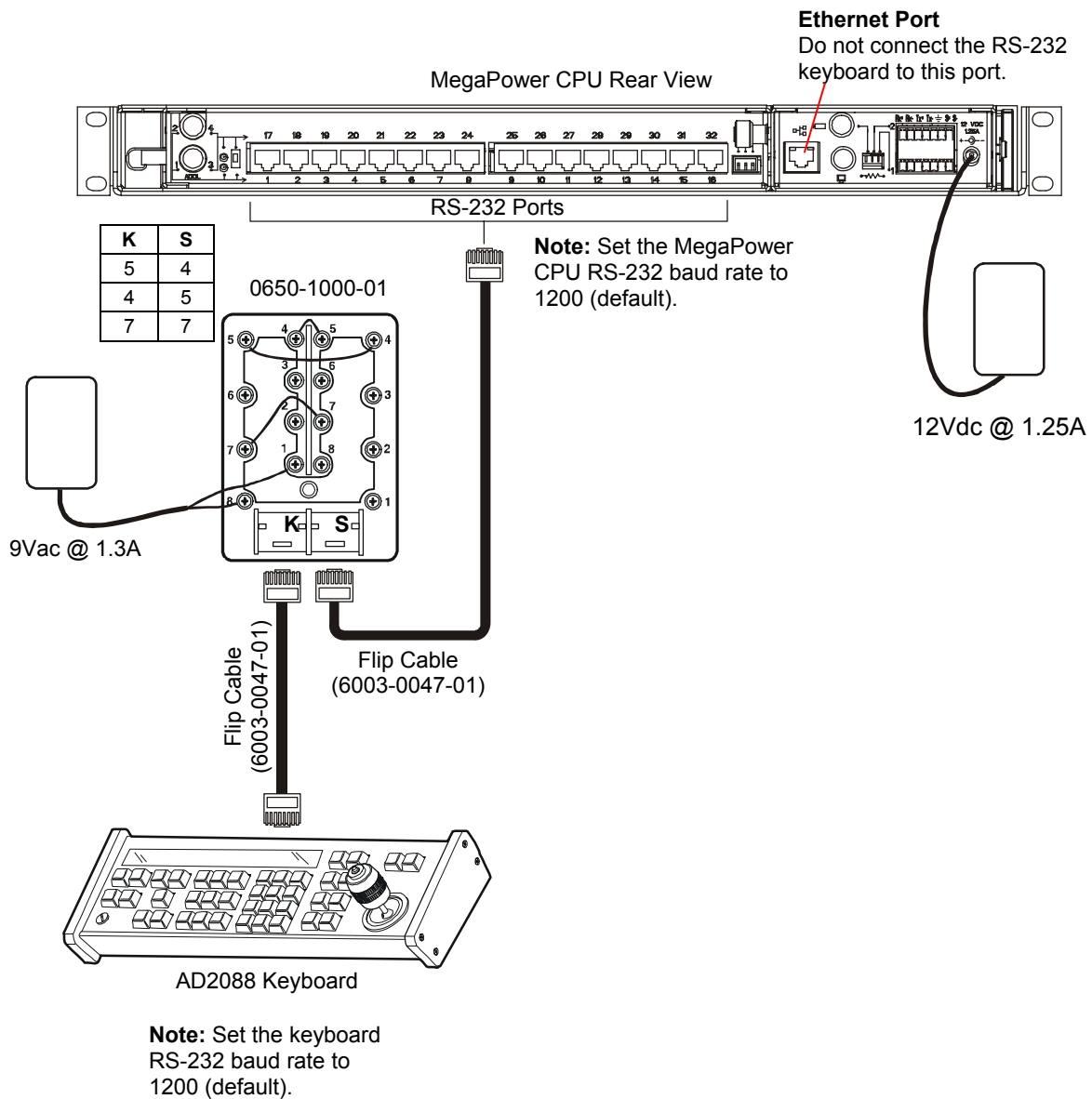
(shown with one video output line dedicated to the Snapshot function)



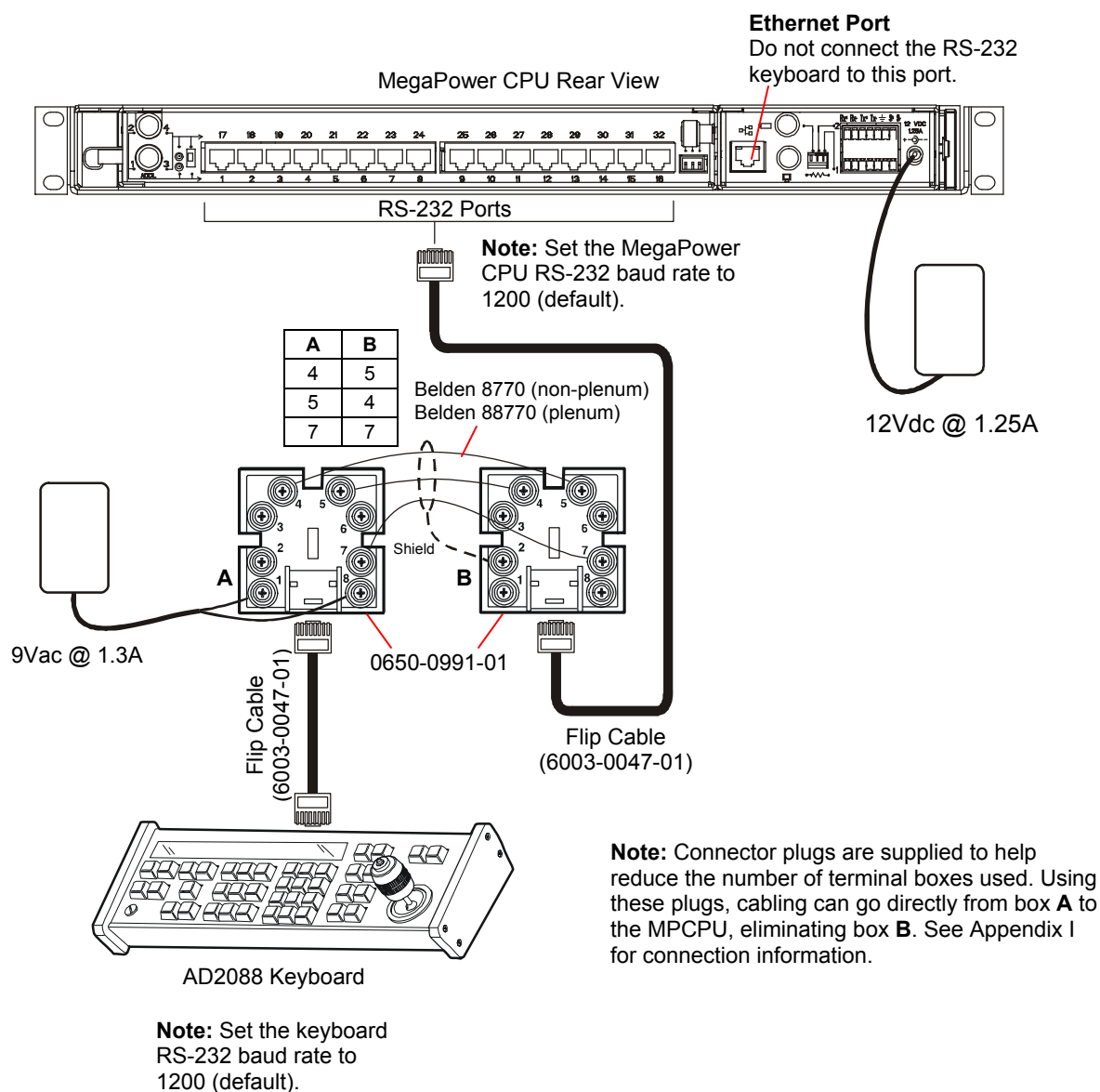
Note: See Administrator's Guide for Snapshot and TFTP server configuration, and for how to take Snapshot images.

Appendix D: AD2088 Keyboard to MPCPU Connections

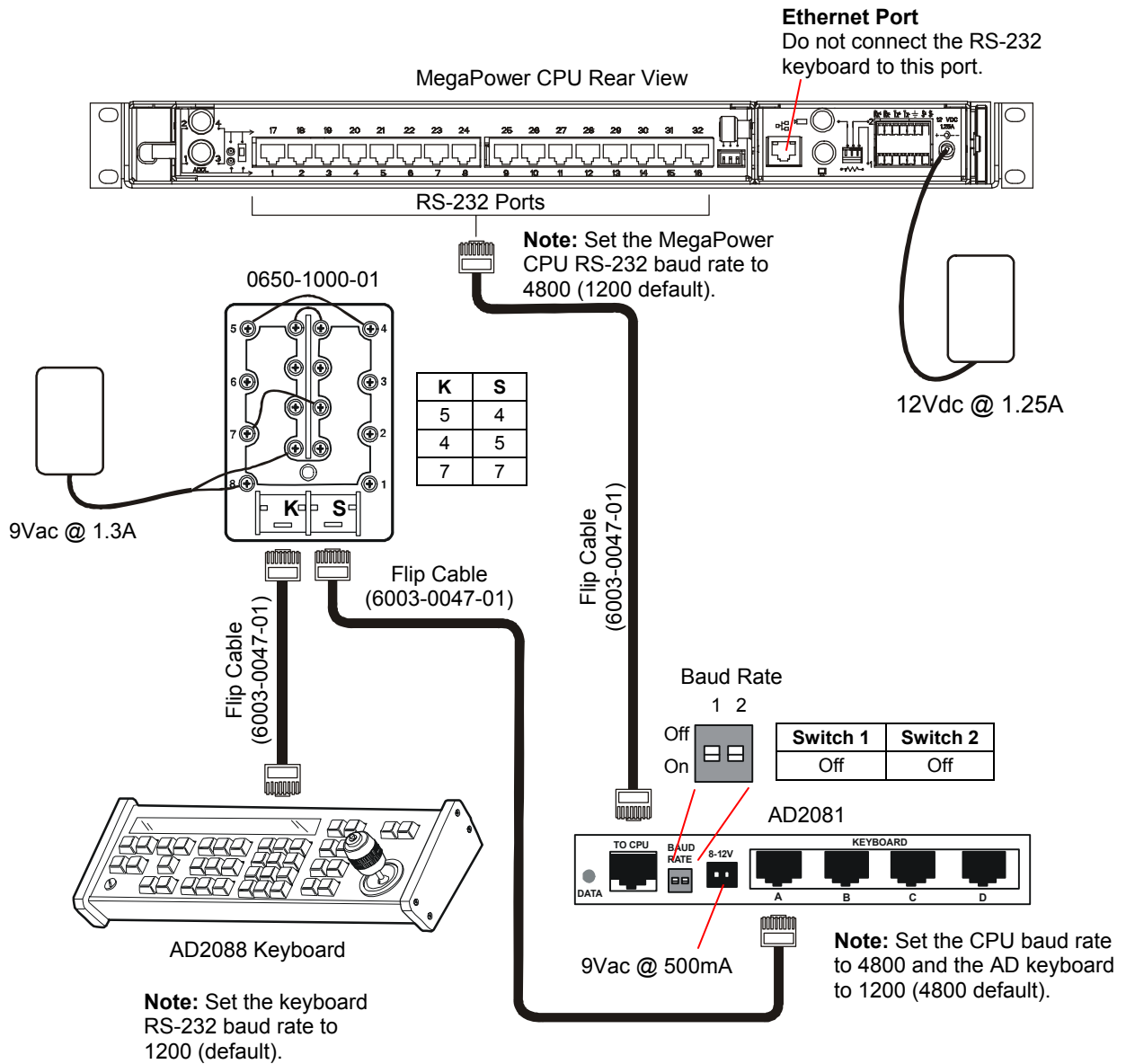
AD2088 > MPCPU (less than 2 meters (7 Feet))



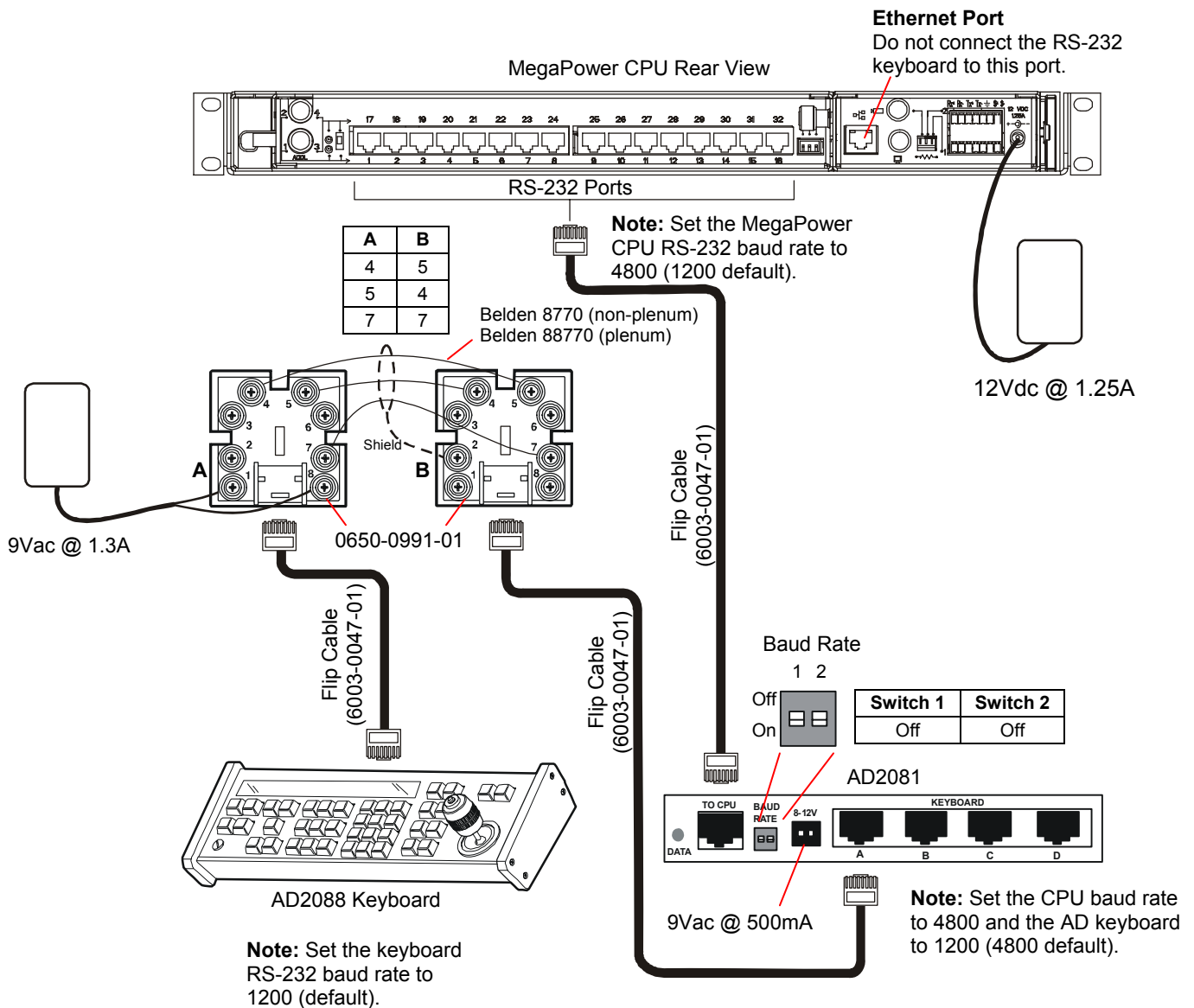
AD2088 > MPCPU (2– 305 meters (7–1000 feet) maximum at 1200 Baud)



AD2088 > AD2081 > MPCPU (less than 2 meters (7 feet))



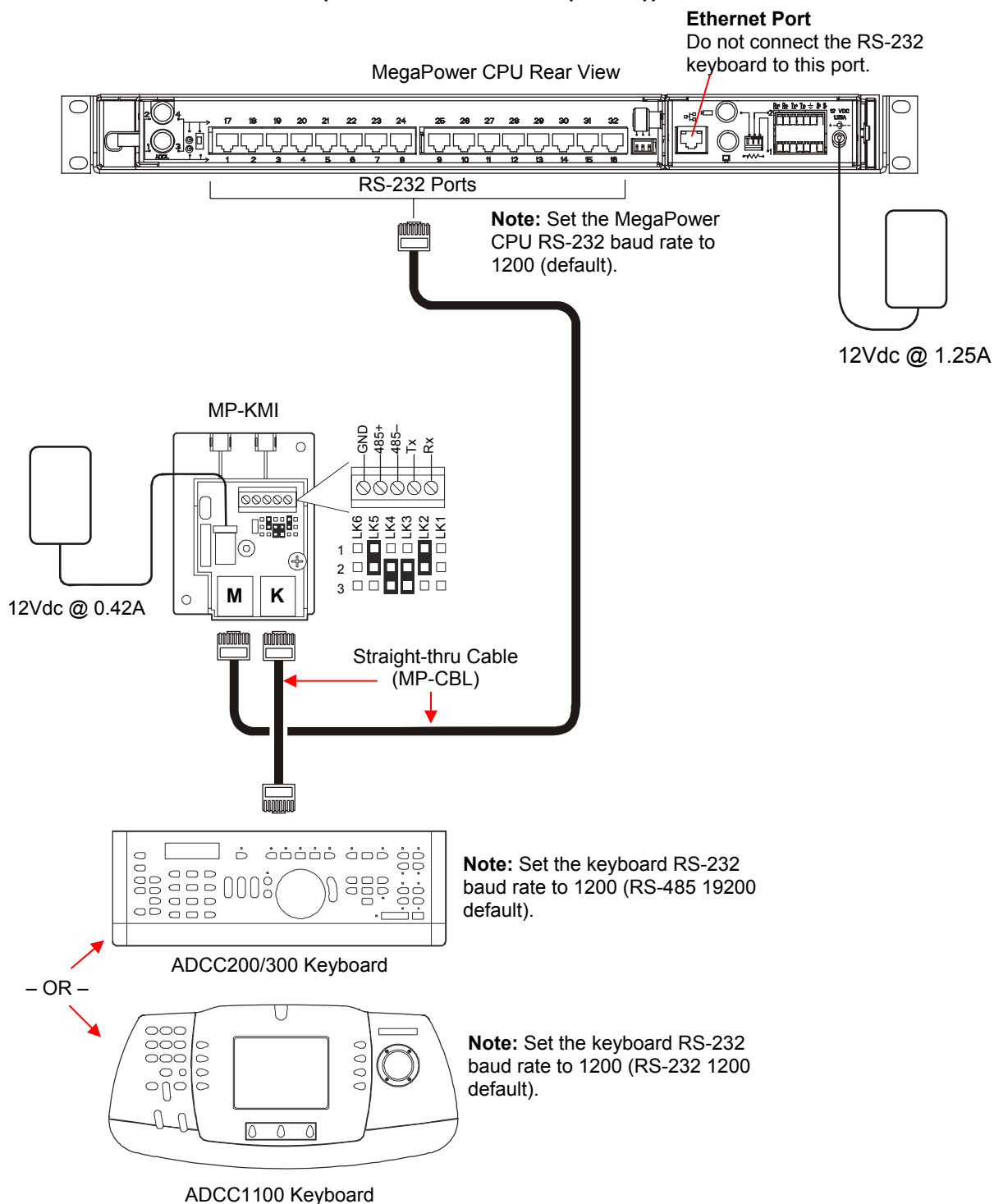
AD2088 > AD2081 > MPCPU (2–305 meters (7–1000 feet) maximum at 1200 Baud)



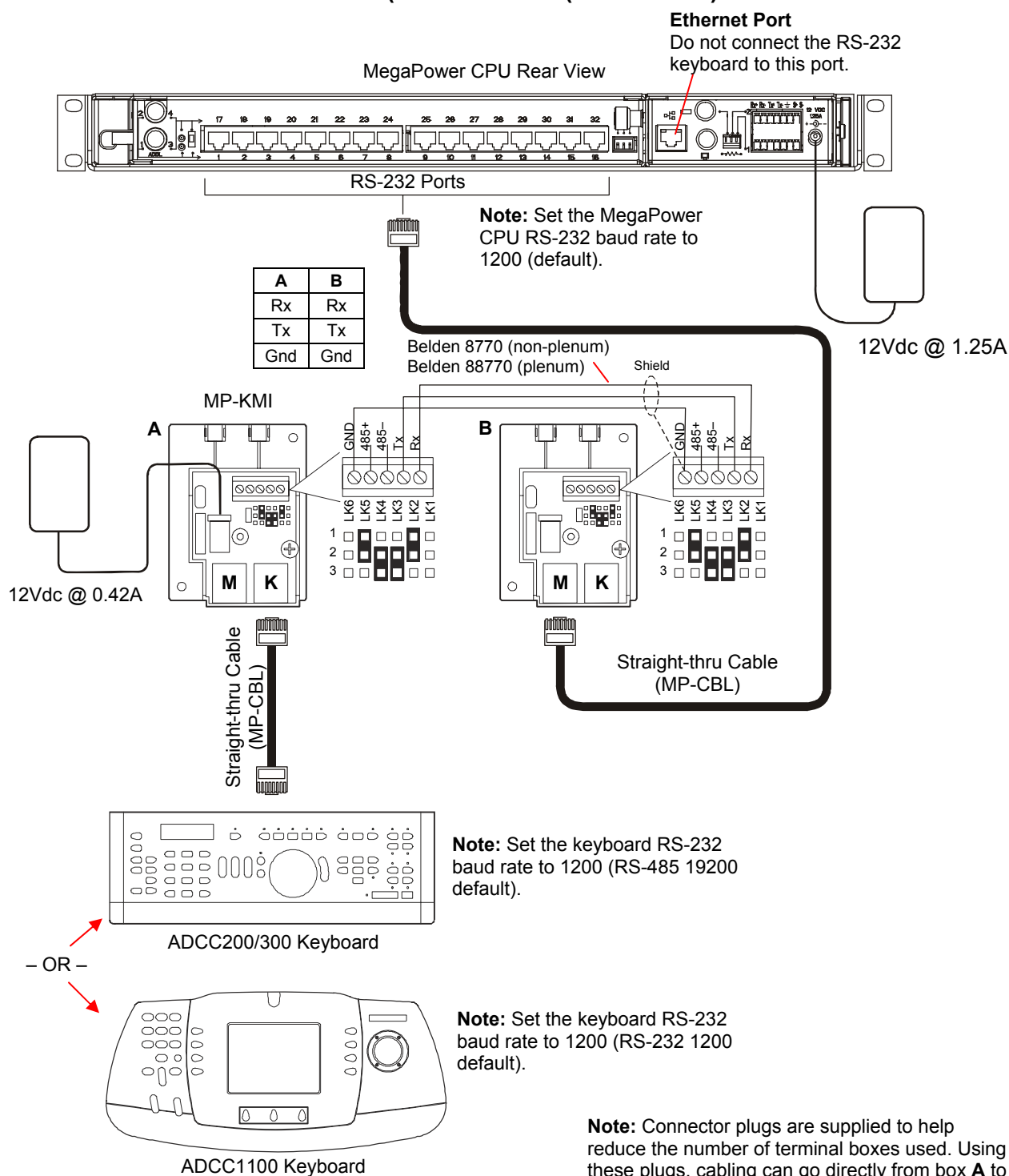
Note: Connector plugs are supplied to help reduce the number of terminal boxes used. Using these plugs, cabling can go directly from box **A** to the MPCPU, eliminating box **B**. See Appendix I for connection information.

Appendix E: ADCC200/300/1100 Keyboard to MPCPU Connections

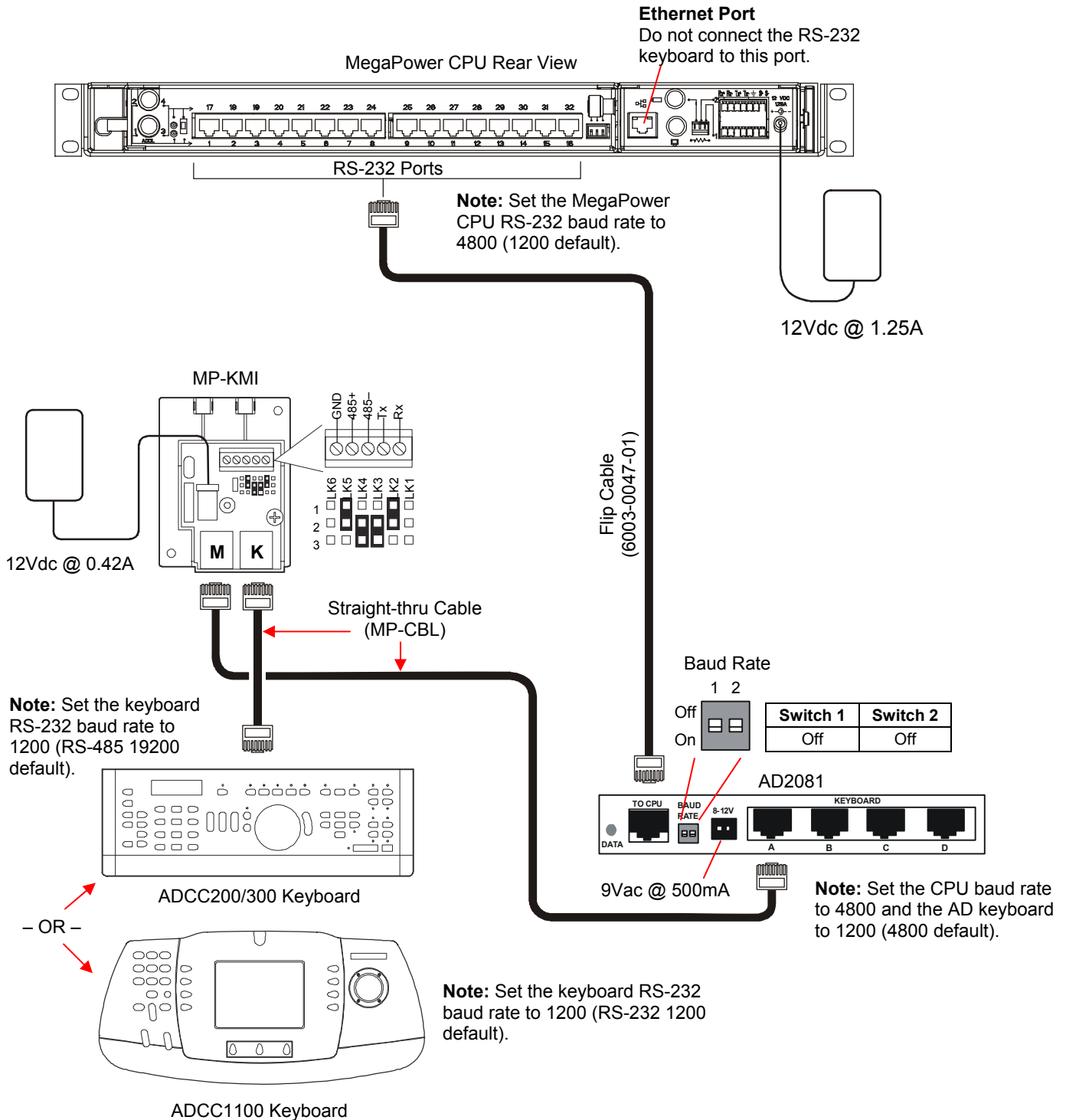
ADCC200/300/1100 > MPCPU (less than 2 meters (7 feet))



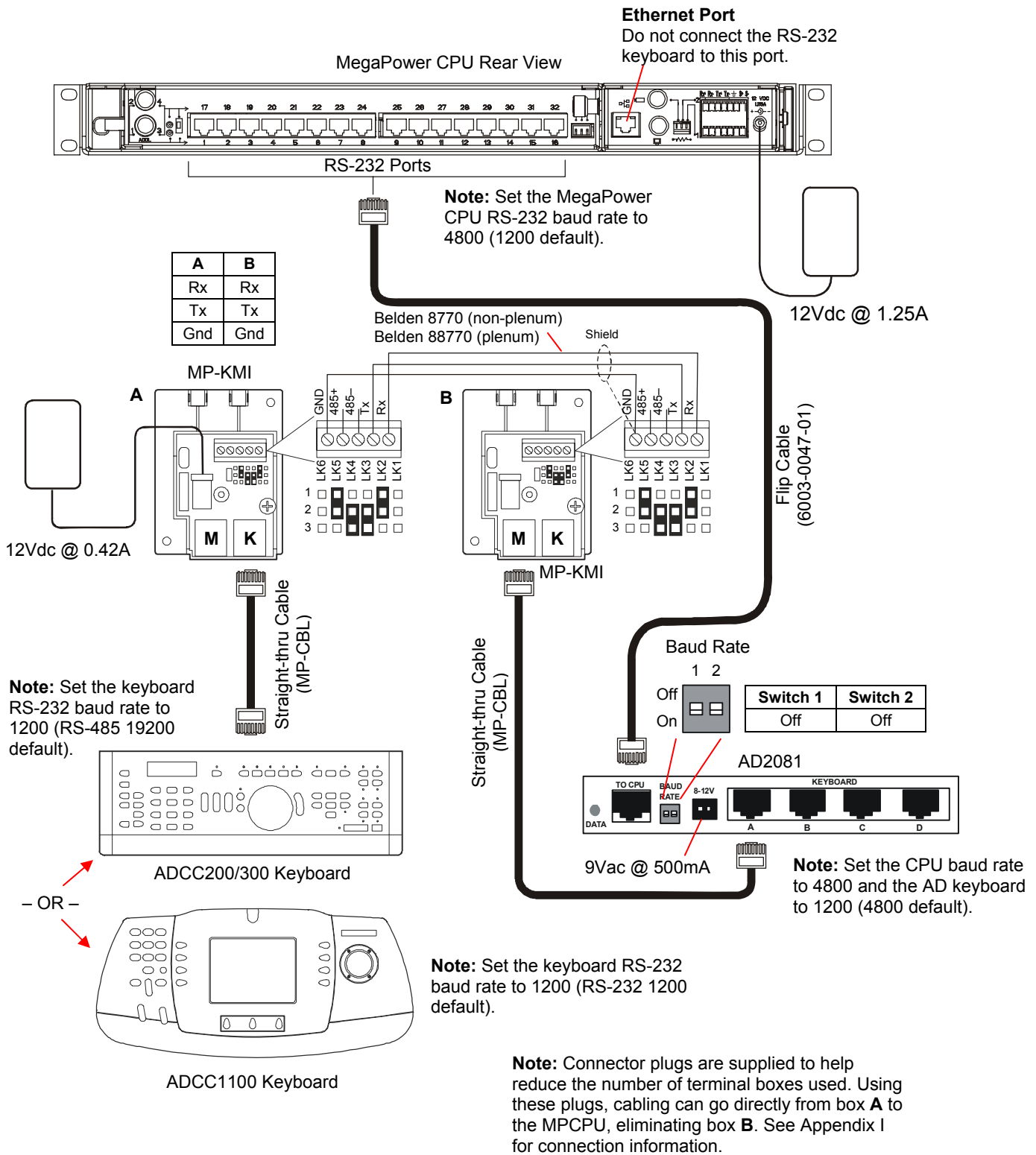
ADCC200/300/1100 > MPCPU (2–305 meters (7–1000 feet) maximum at 1200 Baud)



ADCC200/300/1100 > AD2081 > MPCPU (less than 2 meters (7 feet))

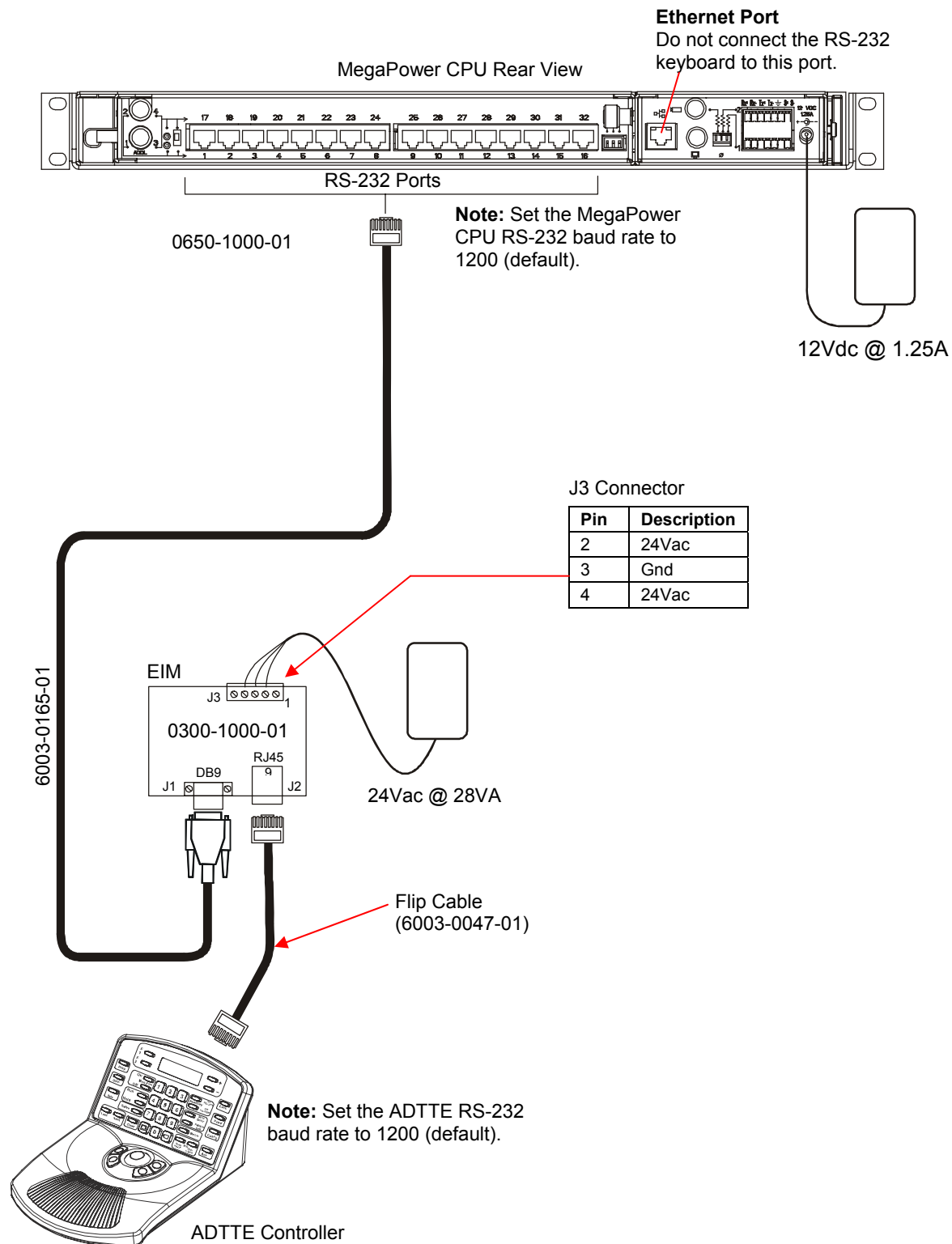


ADCC200/300/1100 > AD2081 > MPCPU
(2–305 meters (7–1000 feet) maximum at 1200 Baud)

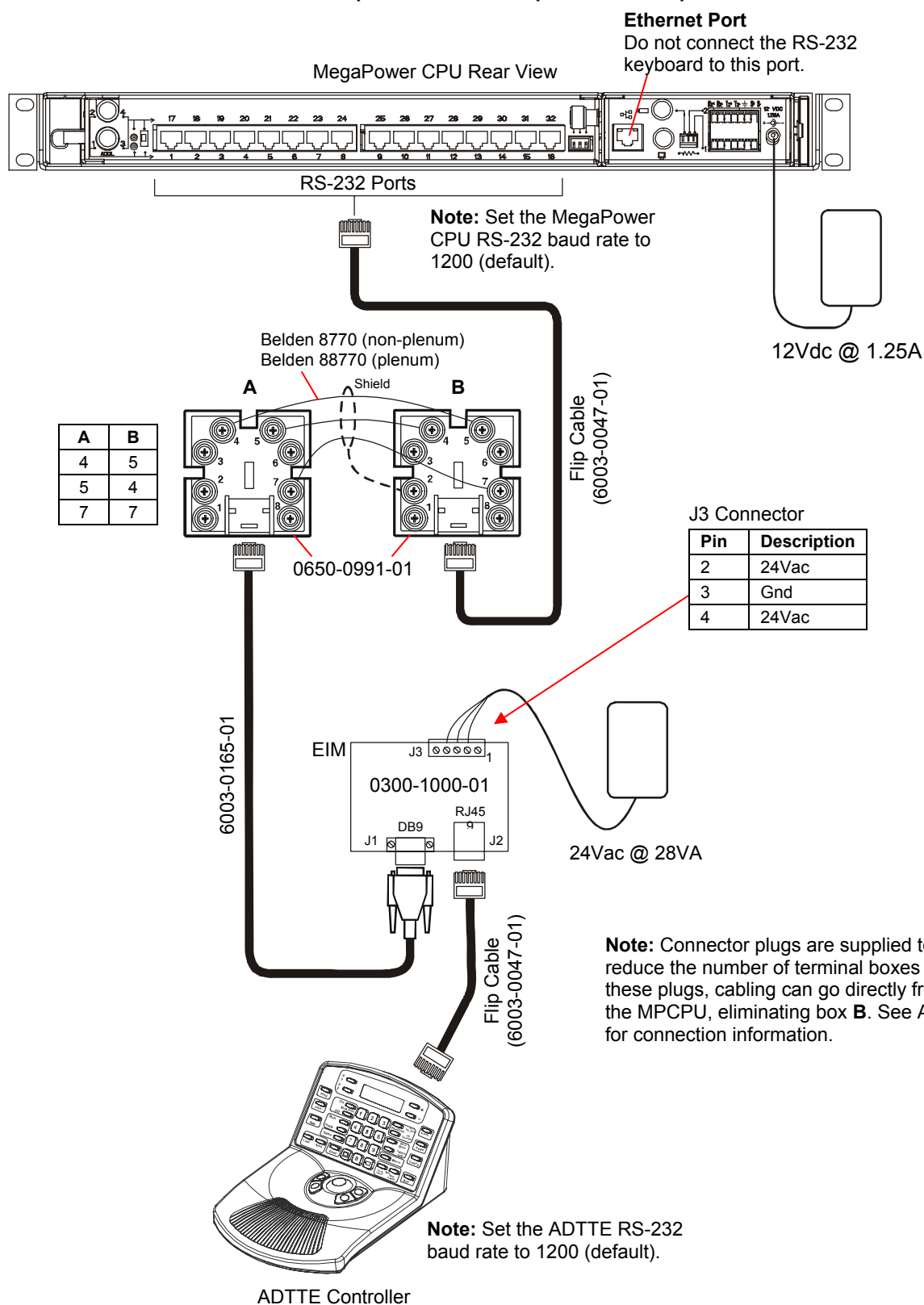


Appendix F: ADTTE Controller to MPCPU Connections

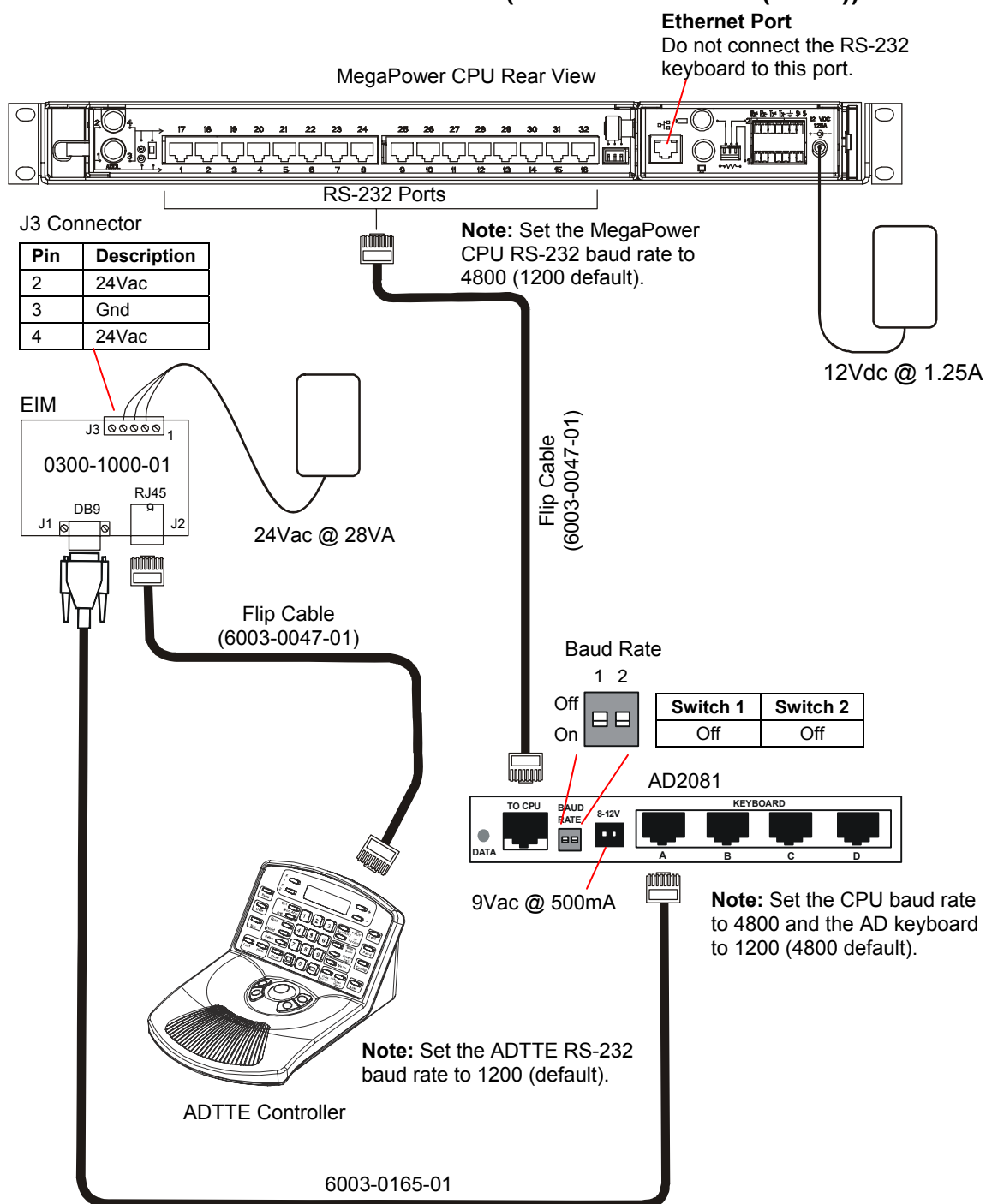
ADTTE Controller > MPCPU (less than 2 meters (7 feet))



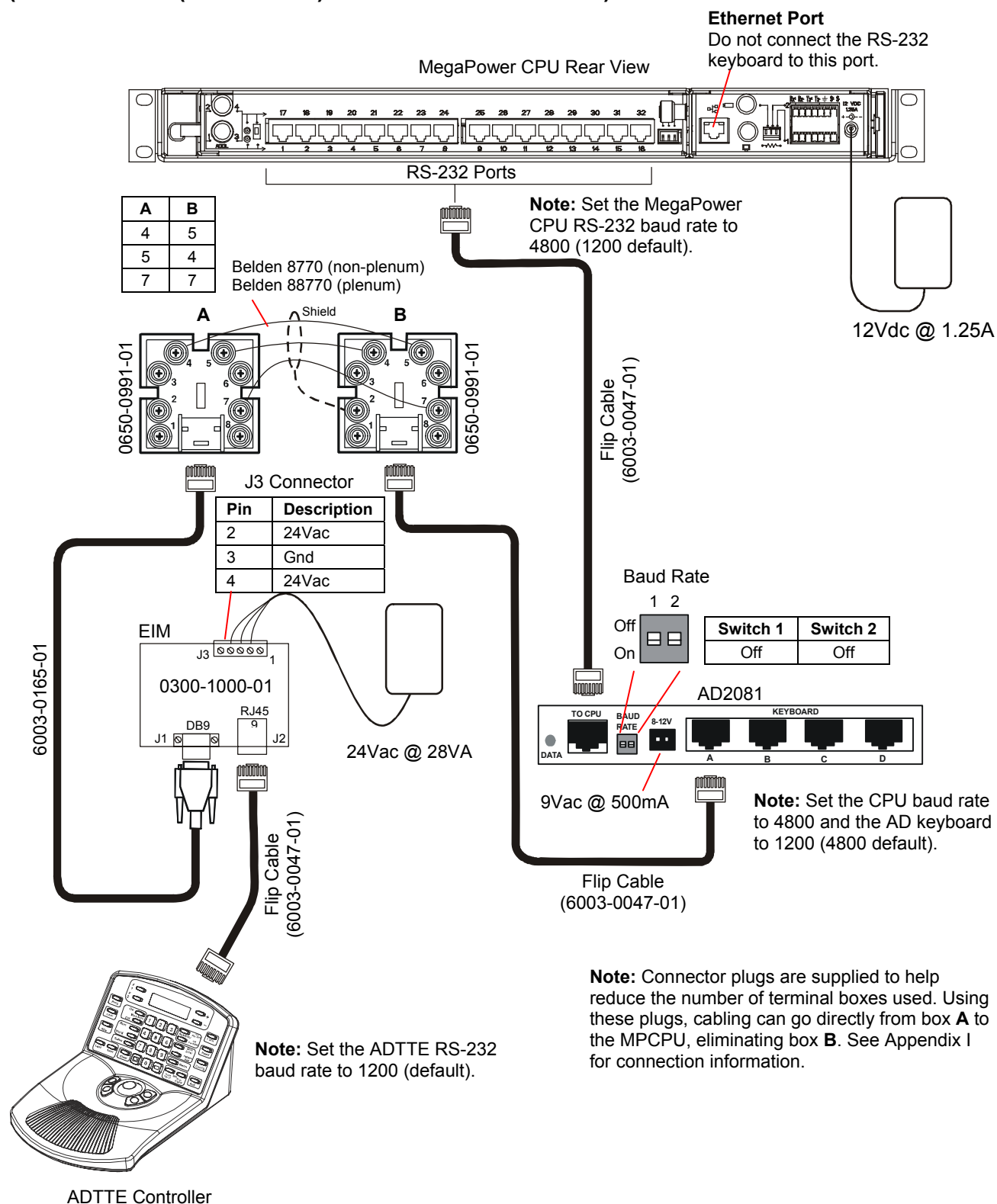
ADTTE Controller > MPCPU (2–305 meters (7–1000 feet) maximum at 1200 Baud)



ADTTE Controller > AD2081 > MPCPU (less than 2 meters (7 feet))

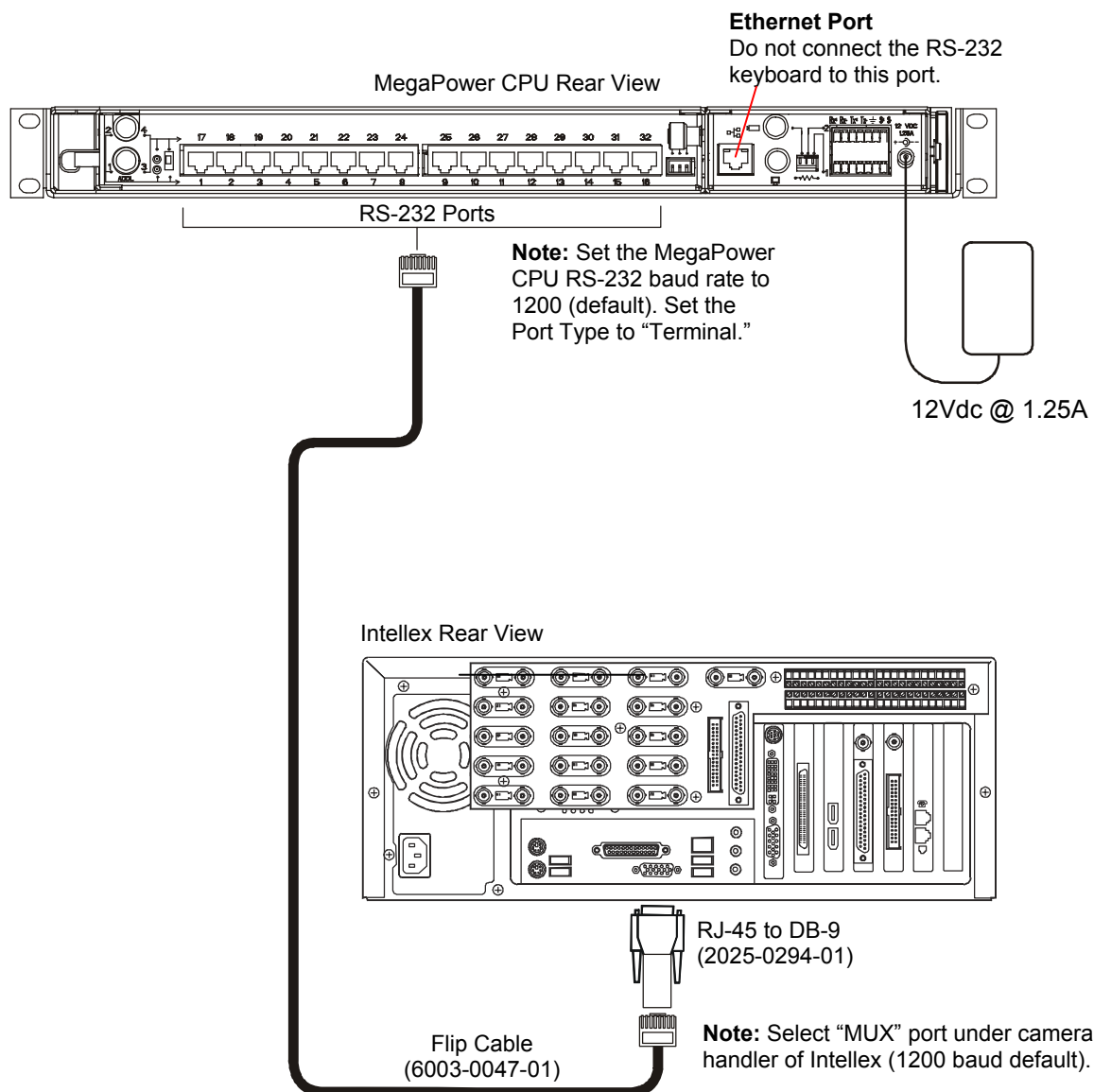


ADTTE Controller > AD2081 > MPCPU **(2–305 meters (7–1000 feet) maximum at 1200 Baud)**

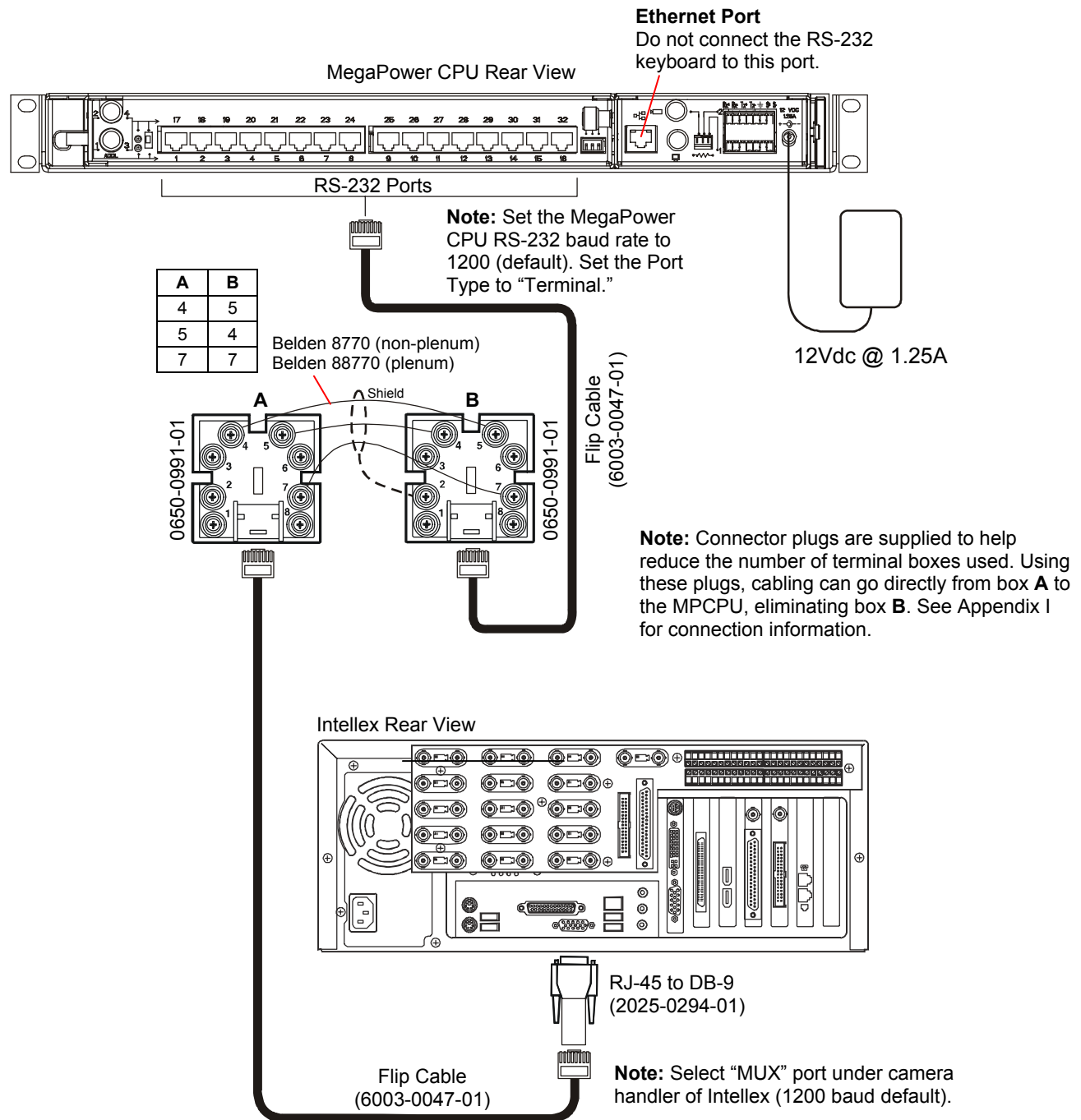


Appendix G: Intellex to MPCPU Connections

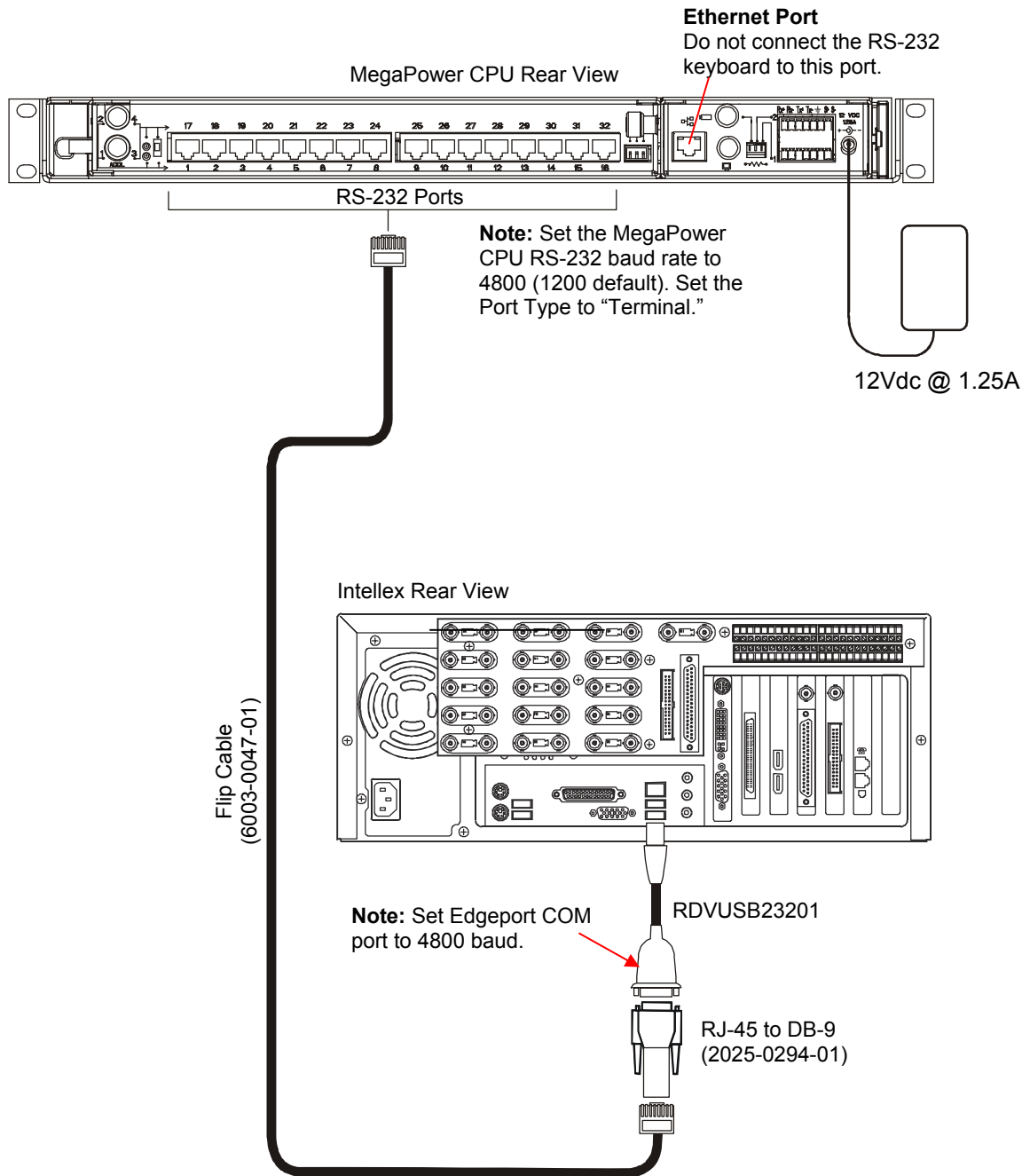
Intellex > MPCPU via S3 Kit (less than 2 meters (7 feet))



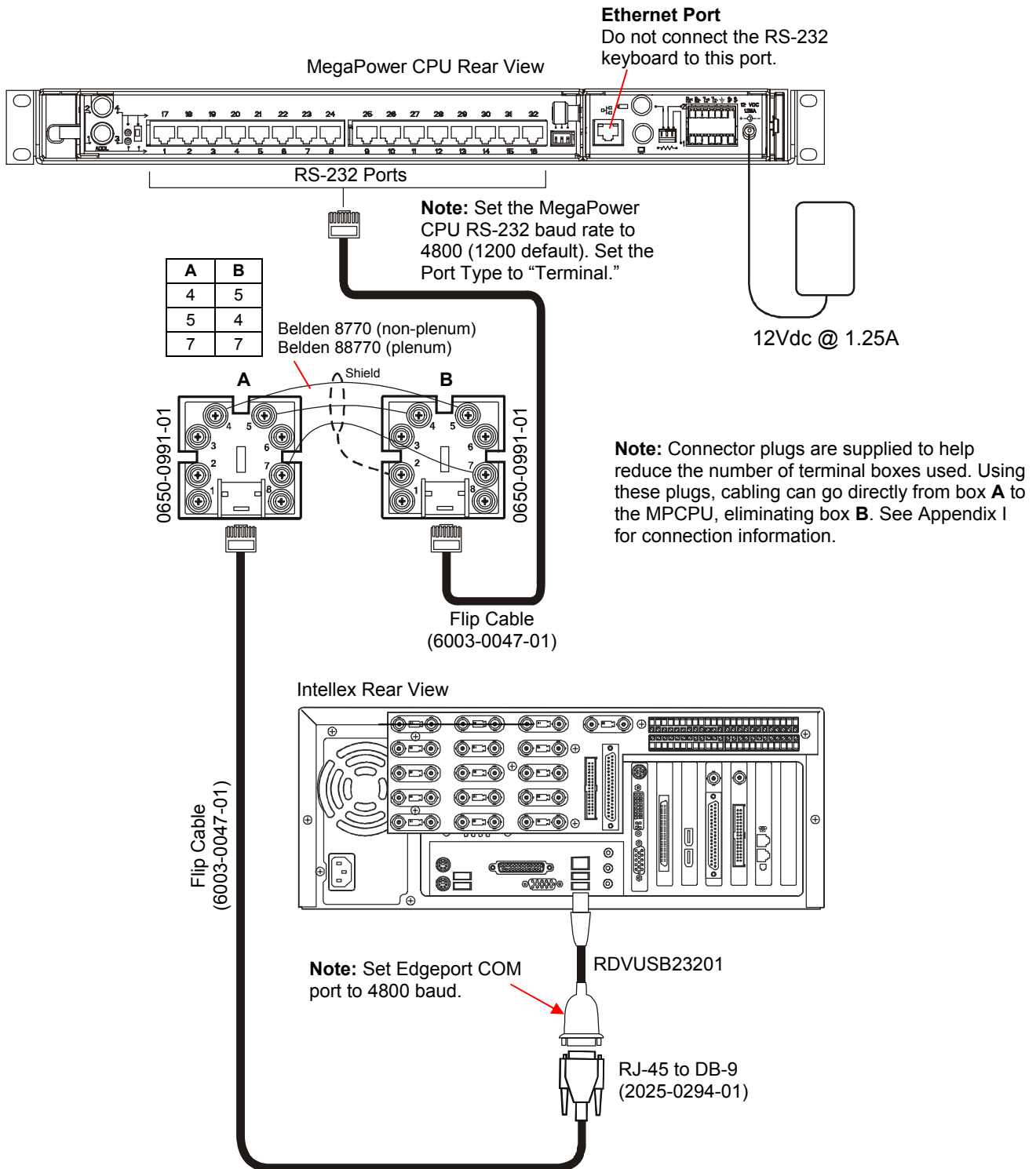
Intellex > MPCPU via S3 Kit (2–305 meters (7–1000 feet) maximum at 1200 baud)



Intellex > MPCPU via USB to Serial Adapter (less than 2 meters (7 feet))

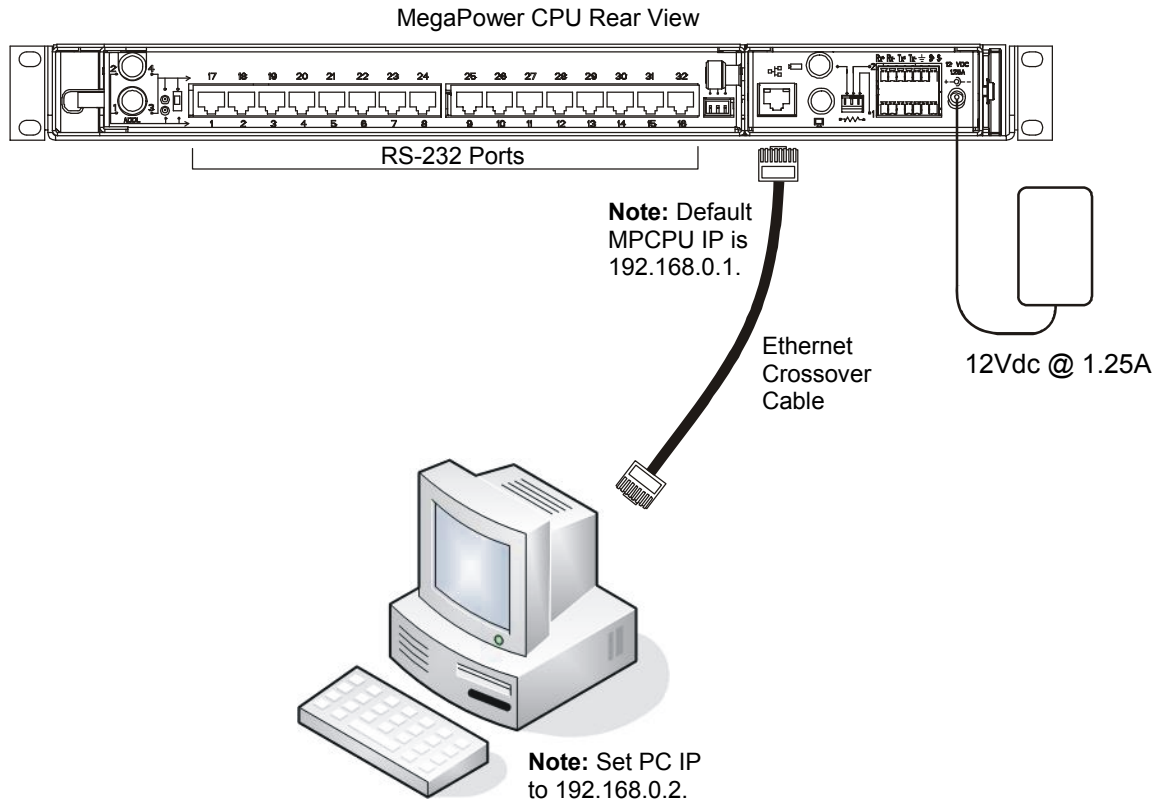


Intellex > MPCPU via USB > Serial Adapter **(2–15.2 meters (7–50 feet) maximum at 4800 baud)**

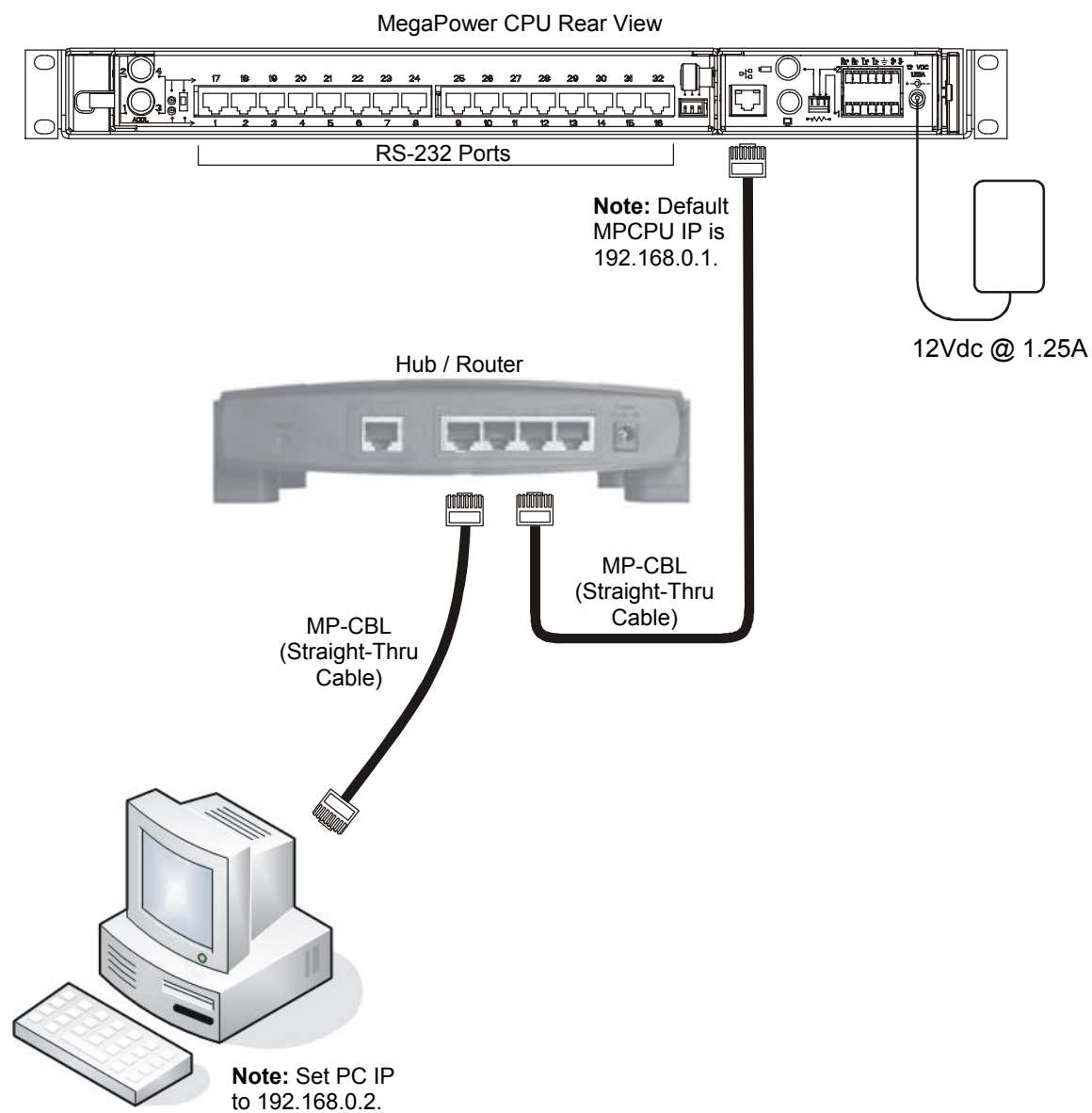


Appendix H: Computer to MPCPU Connections

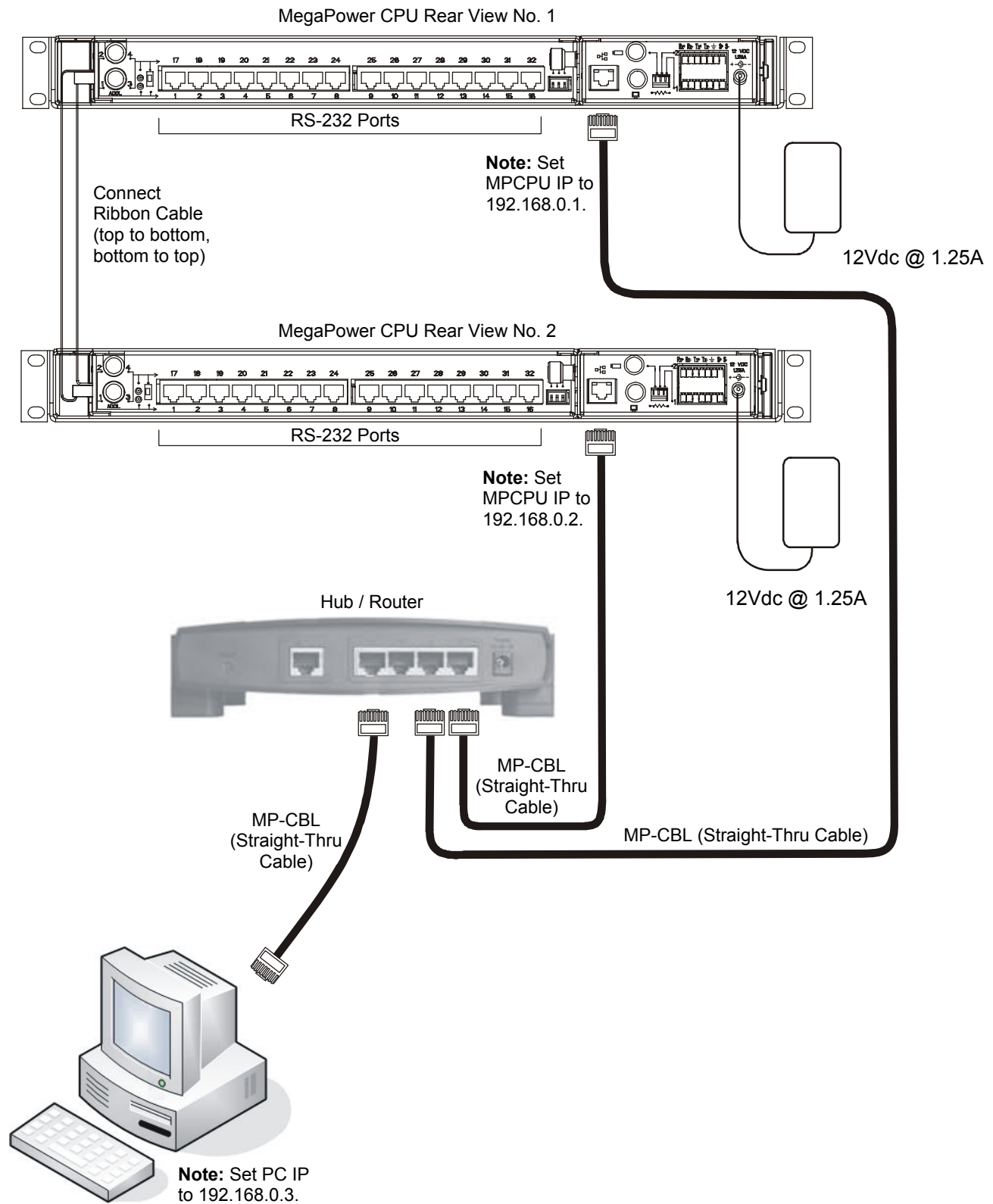
Computer > MPCPU PC Connection Using Ethernet Crossover Cable



Computer > MPCPU Connection Using a Hub or Router

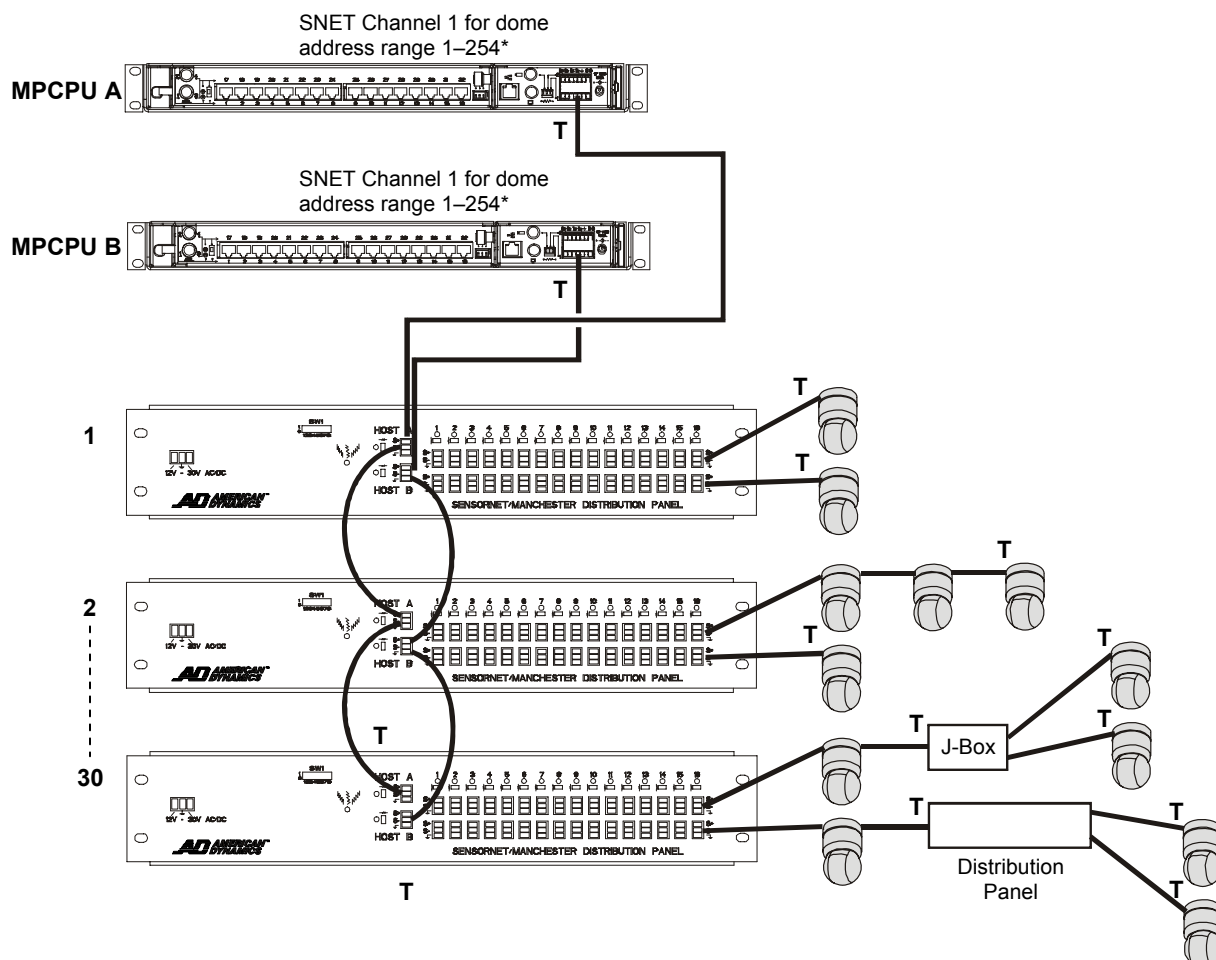


Computer > MPCPU “Hot Switch” Connection Using a Hub or Router

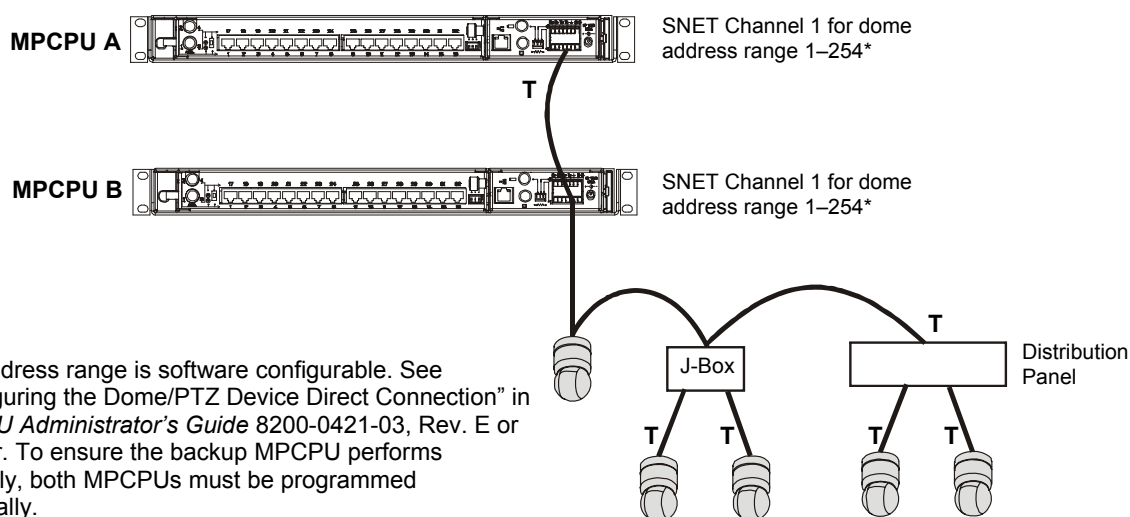


Appendix I: MPCPU to Dome Connection Examples

Example 1



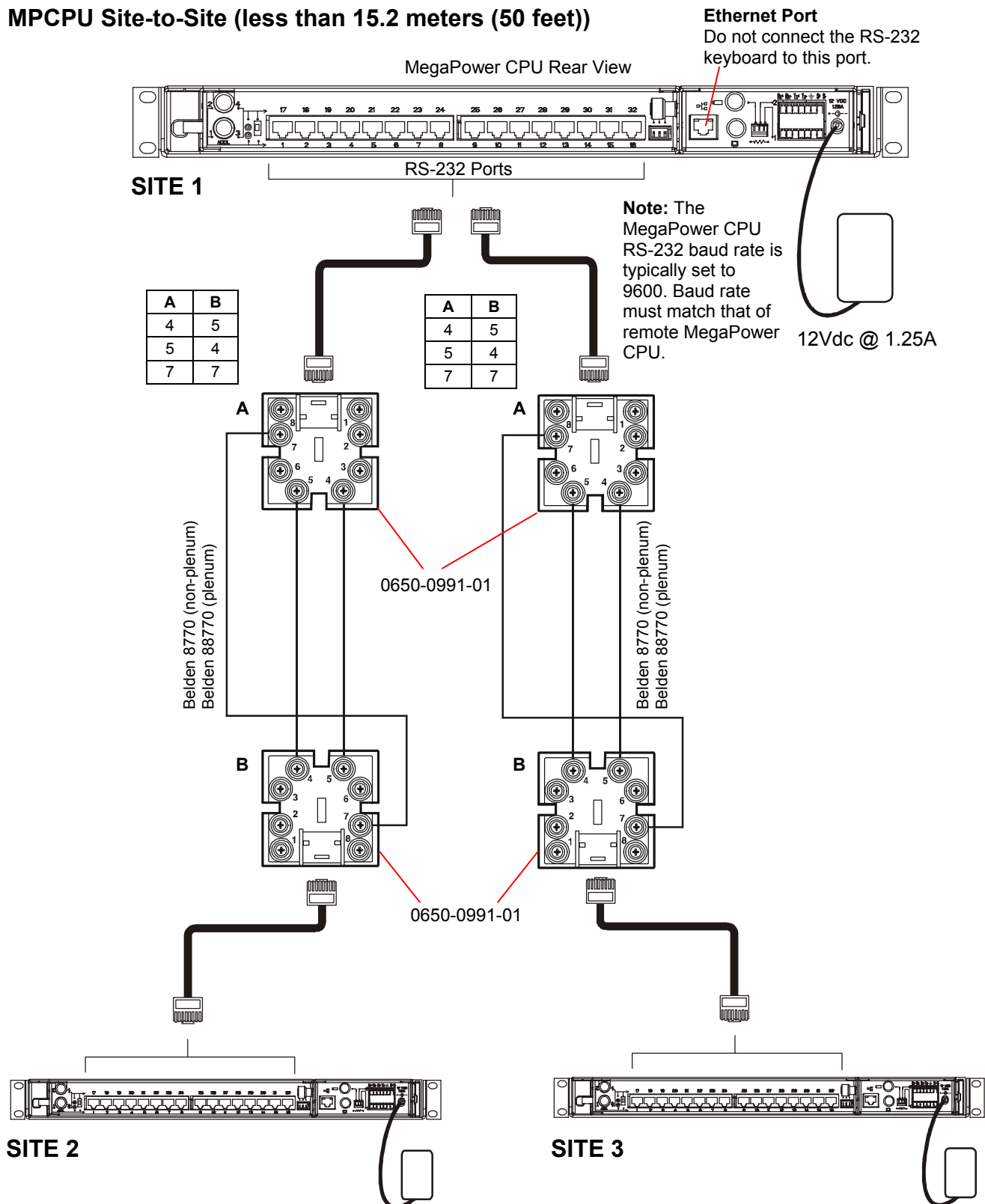
Example 2



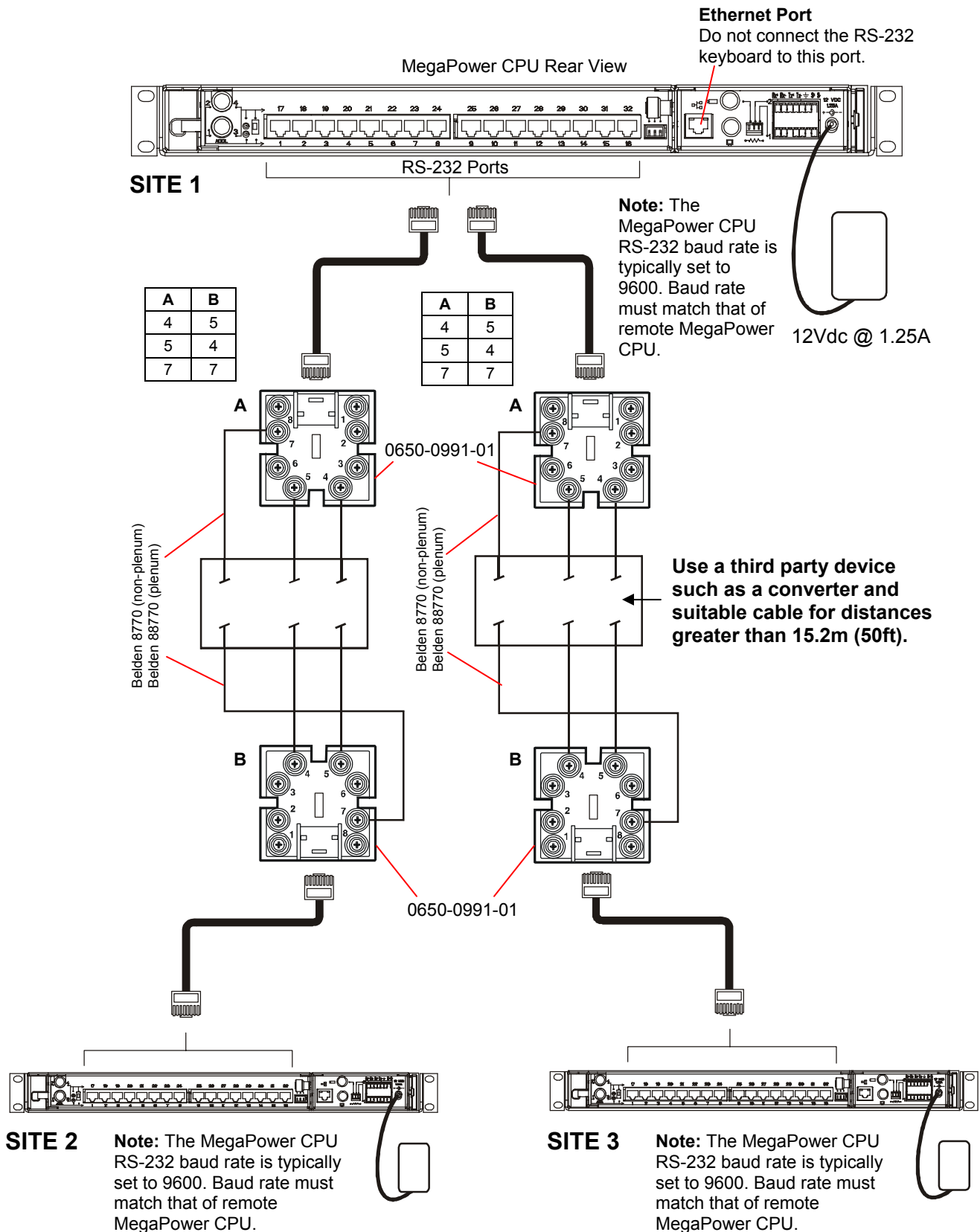
* The address range is software configurable. See "Configuring the Dome/PTZ Device Direct Connection" in *MPCPU Administrator's Guide* 8200-0421-03, Rev. E or greater. To ensure the backup MPCPU performs correctly, both MPCPUs must be programmed identically.

Appendix J: MPCPU Site-to-Site at 9600 Baud Connection Examples

MPCPU Site-to-Site (less than 15.2 meters (50 feet))



MPCPU Site-to-Site (greater than 15.2 meters (50 feet))



Appendix K: Flip Cable Connections

Connector plugs are supplied to help reduce the use of terminal boxes. To connect the plugs to the user supplied 0.326mm² (22AWG) cabling, refer to the table below. For how to connect wires, see instructions supplied with the plugs.

Note: The maximum RS-232 cable distance possible depends on the data rate, environment electrical noise, and the inherent cable capacitance. Using low capacitance 0.326mm² (22AWG) or larger cable in a typical installation, 300m (1000ft) have been used at a 1200BPS data rate, and 15m (50ft) at a 9600BPS data rate and above.

MPCPU	Keyboard
Tx (Pin 4)	Rx (Pin 5)
Rx (Pin 5)	Tx (Pin 4)
Ground (Pins 2 and 7)	Ground (Pins 2 and 7)

NOTES:

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